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Rewinding and complete rebuilding for all electrical machines, up to the largest and heaviest industrial generators and electrical equipment, is provided by full, 24-hour working capacity, seven days a week, at the new ARCO Service Depot. With the most advanced and efficient methods, and a final high-voltage test to guarantee perfection, ARCO Rewinds give you the fastest emergency service in Great Britain today for all electrical repairs to both A.C. and D.C. machines.

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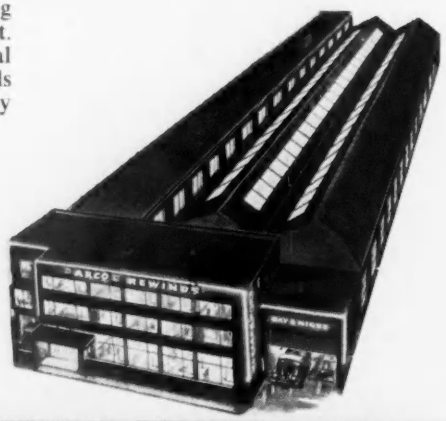
Collection and delivery in **YOUR** *area.*



ARCO REWINDS Coventry Road BIRMINGHAM 26 Telephone SHEldon 4233

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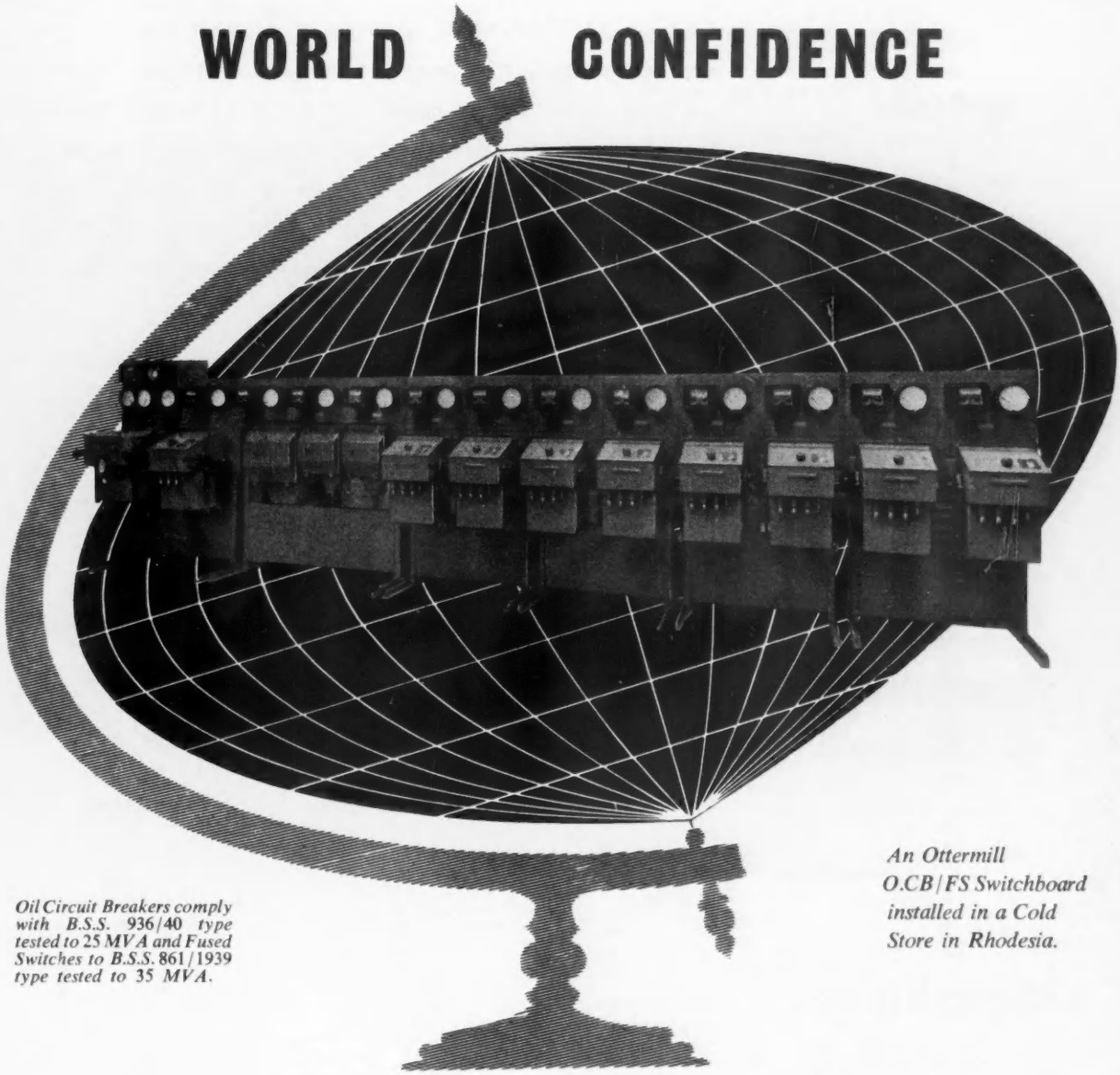

Oil Circuit Breakers comply with B.S.S. 936/40 type tested to 25 MVA and Fused Switches to B.S.S. 861/1939 type tested to 35 MVA.

An Ottermill O.CB/FS Switchboard installed in a Cold Store in Rhodesia.

For new industries, new factories or modernisation of existing installations in all parts of the world, Ottermill Switchgear is specified because of its safety, efficiency, reliability and standardisation. Complying with British standards this top quality equipment is thoroughly tested before leaving the factory. Ottermill switchboards are fitted with oil circuit breakers and fused switches which have been type tested and are designed to withstand those short circuit conditions which may arise in industrial supply networks.

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2652

A

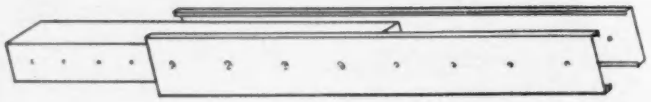
speed

rigidity

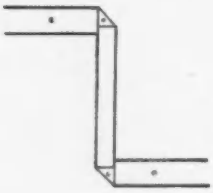
flexibility

adaptability

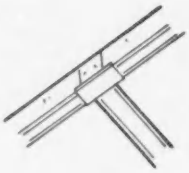
CRYSELCO TRUNKING is simple to assemble and very quick erection is possible by using the special suspensions. Two men working under normal conditions can erect several hundred feet of trunking in a day. Other electrical services can be carried in the wiring ducts on each side of the centre section. Additional fittings can be erected in a matter of minutes and the existing ones can be repositioned merely by loosening two screws.



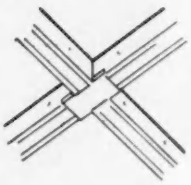
The overlap method of construction ensures fixings up to 18 ft centres



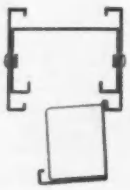
90° riser



T joint

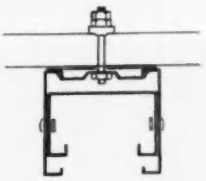


crossover



easy maintenance

easy assembly



easy erection

CRYSELCO TRUNKING LIGHTING SYSTEM

REDUCED INSTALLATION COSTS

Remember to order CRYSELCO Lamps at the same time

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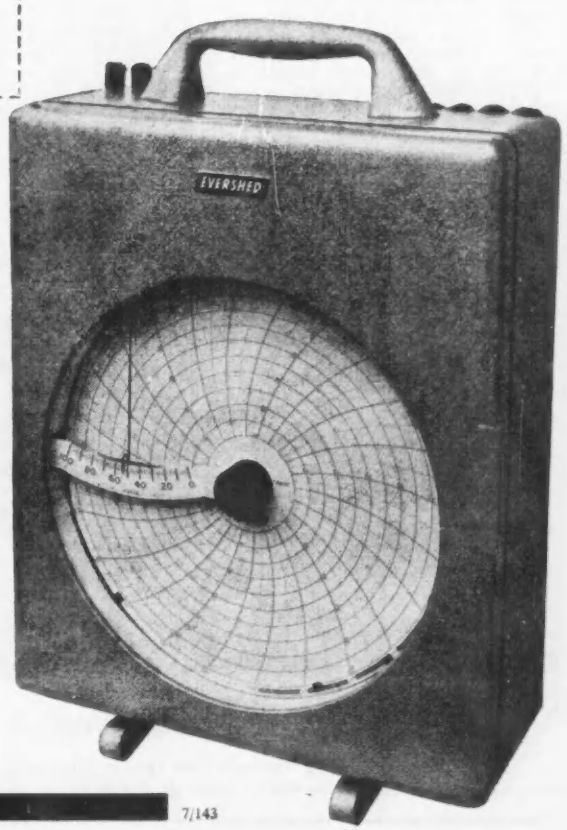
BRANCHES — BIRMINGHAM · BRISTOL · BURY ST. EDMUNDS · CARDIFF · GLASGOW · LEEDS
LEICESTER · LIVERPOOL · LONDON · MANCHESTER · NEWCASTLE · NOTTINGHAM · SOUTHAMPTON

Another *EVERSHED* achievement

DISC CHART RECORDER

This new recorder is available as a **VOLTMETER, AMMETER OR WATTMETER**

It has: an unspillable ink supply which lasts for one year without refilling and is unaffected by dust or harmful ambient conditions; robust Eversheld instrument movement with magnetic damping device; 24 hour or 7 day chart. Synchronous motor or spring clock chart drive. Three alternative models — Surface mounting, Flush Panel mounting or Portable.



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7/143

for the technologists of tomorrow

'ERSKINE HEAP'

Switchgear and Motor Control gear

is installed in

- *UNIVERSITIES*
- *COLLEGES &*
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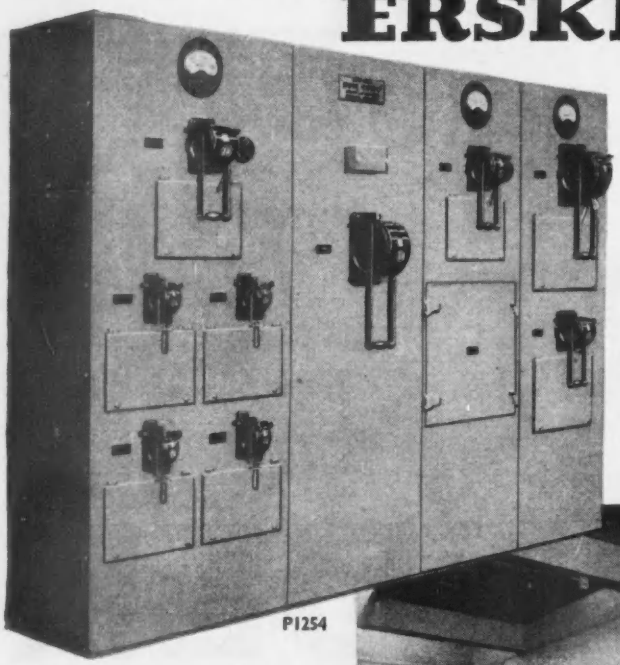
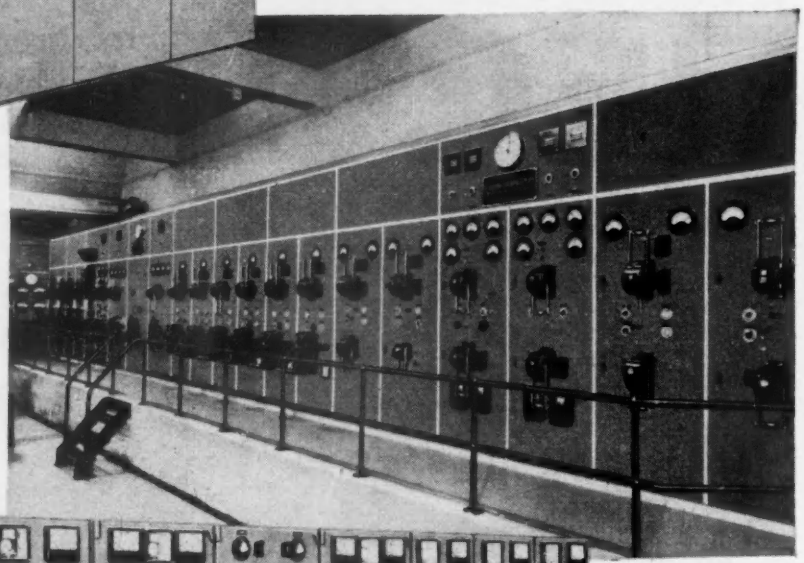


P1254 One of several Switchboards supplied for big new Lancashire School. This switchboard comprises back-of-board type switches, fuses and contactors with front-of-board operation.

P1254

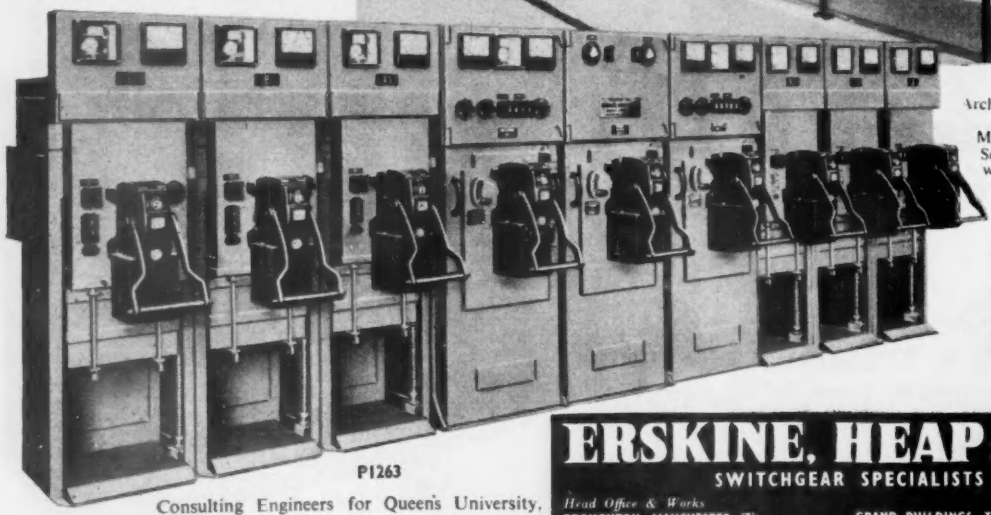


P1256 Illustration shows main switchboard controlling power and lighting at Manchester College of Science and Technology. Switches are of 25 MVA rupturing capacity, tested to BS.116 at 400 volts. Duplicate bus bars are provided with front-of-board operated changeover switches for changing over between the College's own Turbo Alternator set and Electricity Board.

P1263 Switchboard illustrated below is one of several supplied recently to control the power and lighting of the Chemistry & Engineering Building, Queen's University, Belfast, the two incoming units and bus bar coupler being 1600 amp. capacity.

P1256

Architects for the recent extensions to the Manchester College of Science & Technology were Bradshaw, Gass & Hope of Bolton, who were also responsible for the design of the engineering services



P1263

Consulting Engineers for Queen's University, Belfast :— Oscar Faber & Partners.

ERSKINE, HEAP & Co LTD

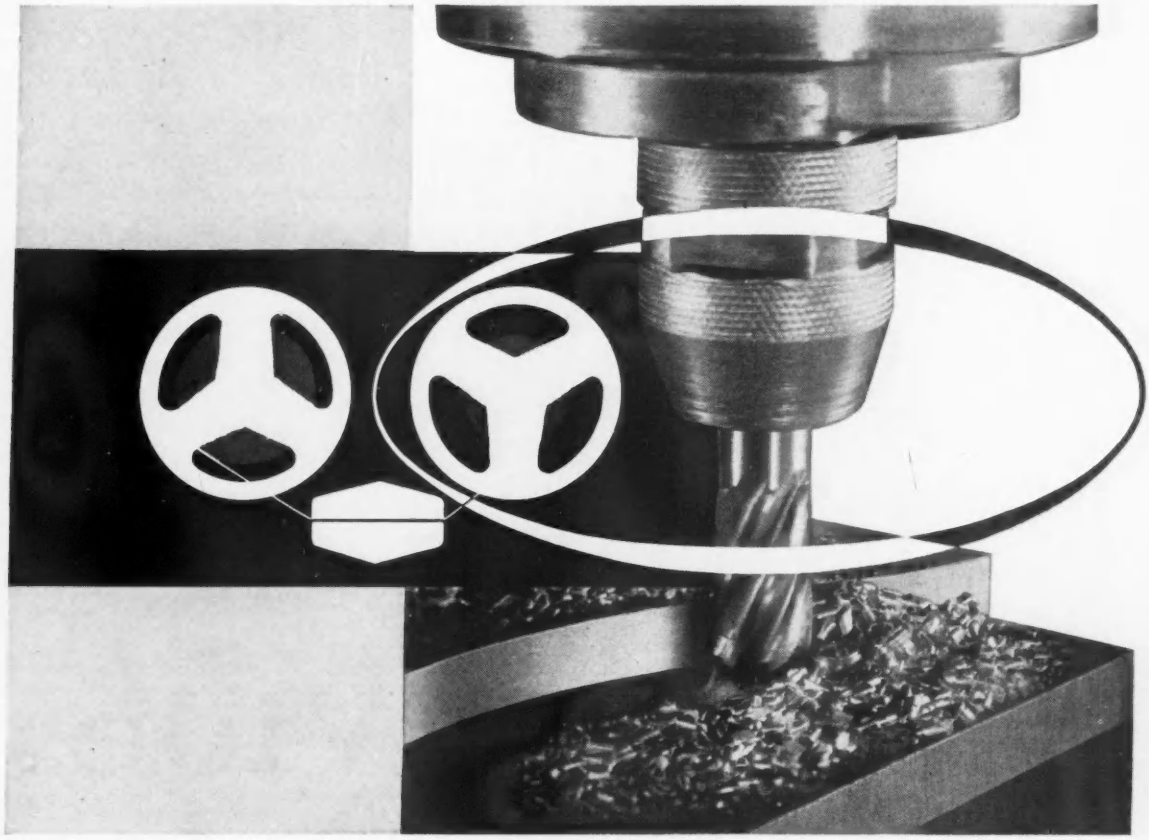
SWITCHGEAR SPECIALISTS

Head Office & Works BROUGHTON, MANCHESTER (7)

London Office GRAND BUILDINGS, TRAFALGAR SQ., W.C.2

BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

723



New, advanced AEI electronic equipment for CONTINUOUS NUMERICAL CONTROL OF MACHINE TOOLS

- Very high accuracy control by magnetic tape. The system is sensitive to 0.0001 in.
- Roughing and finishing cuts made from the same recording.
- Shop-floor adjustment provided for 'off-size' cutters.
- Tape reading equipment fully transistorised.

The AEI Tape Centre offers a high-speed tape preparation service

AEI

Associated Electrical Industries Limited
Electronic Apparatus Division

NEW PARKS, LEICESTER, ENGLAND

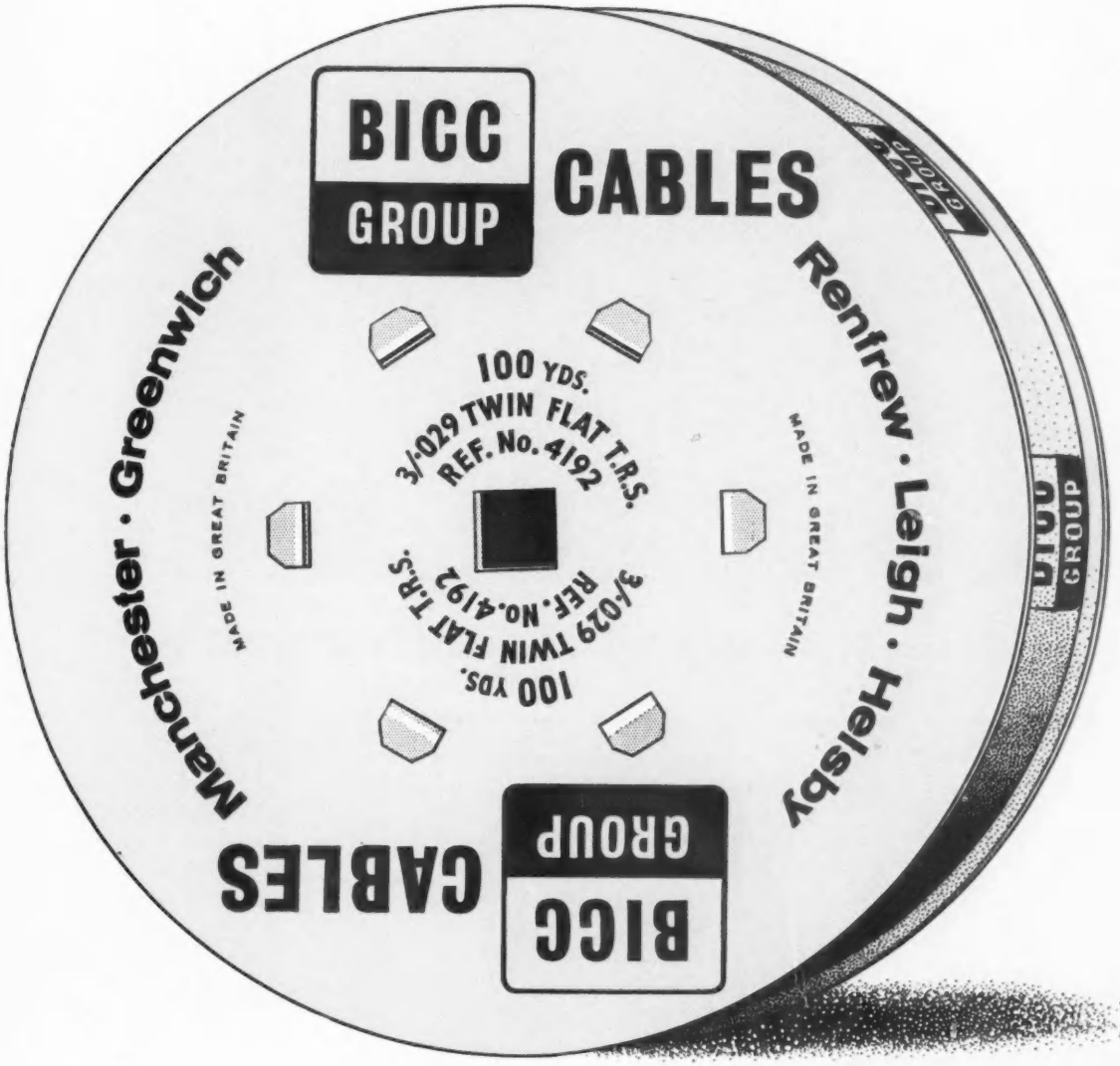
A5526

A*

The sign of a Nation-Wide Service...

. . . representing the total resources of the **Rubber and Thermoplastic Cablemaking Companies of the BICC Group**—now combined to give the Electrical Industry the service it needs.

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 Bloomsbury Street · London WC1



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The result of many years' research and manufacturing experience.

WIDEST RANGE

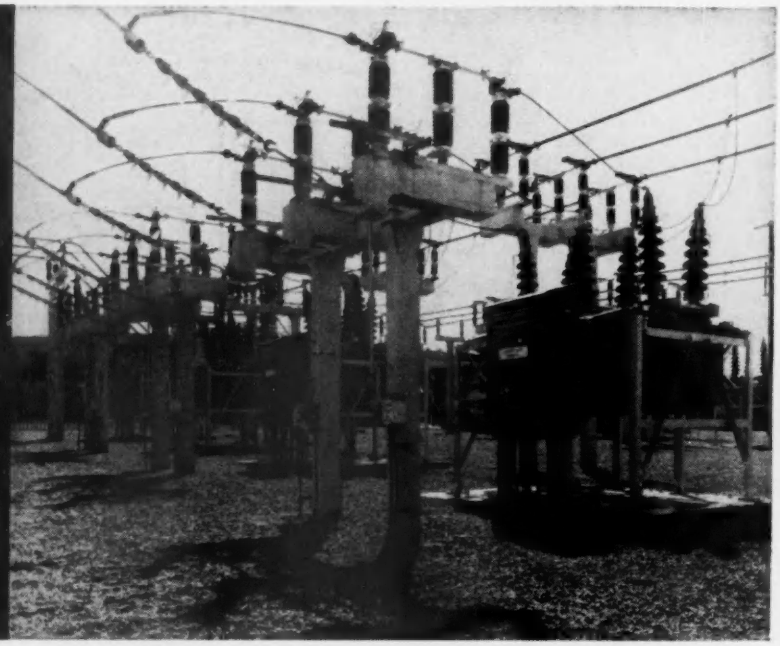
Off-the-shelf service for every kind of rubber and thermoplastic wiring cable.

QUICKEST DELIVERIES

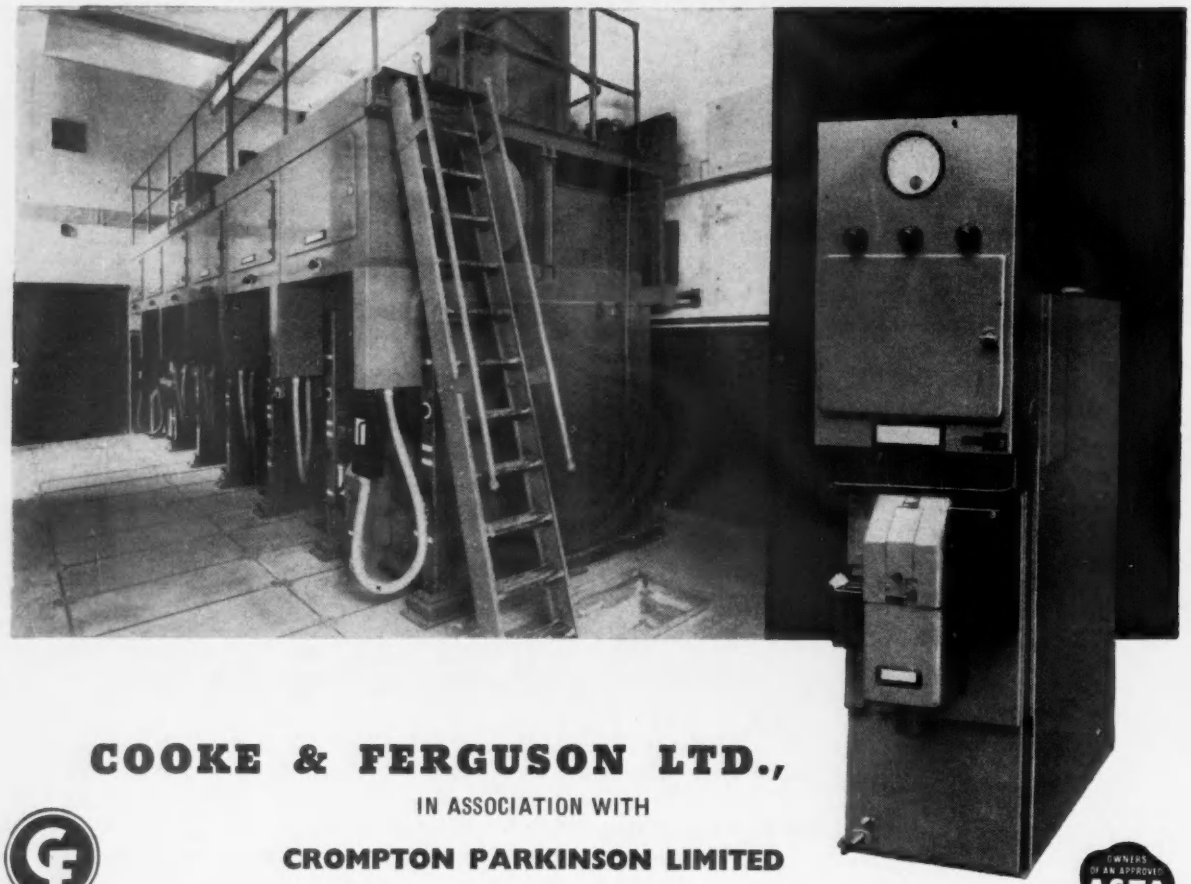
Provided by a network of branches and depots throughout the country.

Backed by an alert technical advisory service
freely available to you at all times

For outdoor or indoor switchgear



. . . up to and including 66kV



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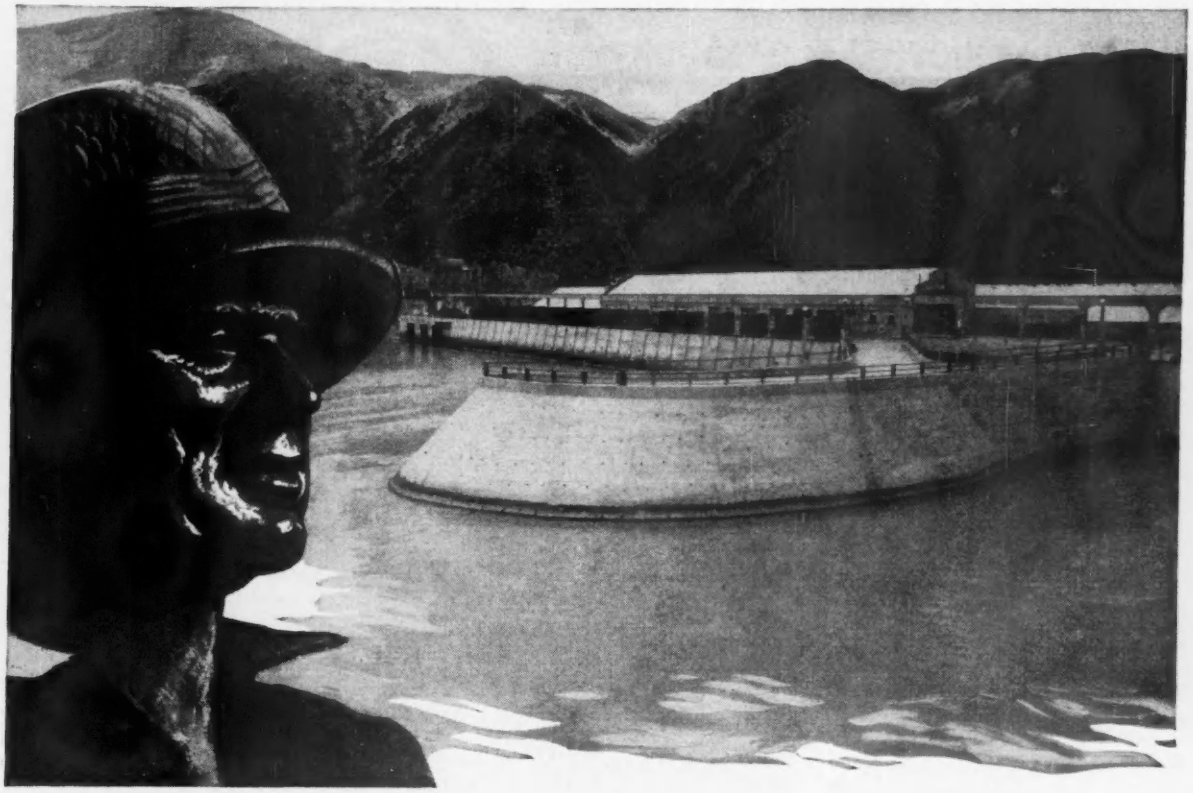
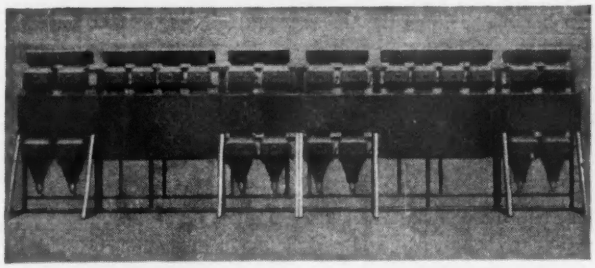


WHEREVER THERE'S POWER THERE'S DENNIS SWITCHGEAR



INDUSTRIAL SWITCHBOARDS

An example of medium voltage distribution switchboard for Atomic Power Station.

Dennis heavy duty medium voltage Switchboards are operating with the greatest efficiency all over the world, in tropical, temperate and cold climatic conditions, for the centralised control of all types of lighting, heating and power circuits. Combinations of fully tested H.R.C. Fused Switches to 800 amps. and Circuit Breakers to 2,000 amps. are designed to individual requirements and will always provide trouble-free operation, ease of maintenance, saving of space and symmetry of appearance. Dennis Switchgear gives complete satisfaction by offering an extensive range of H.R.C. and Rewireable Fuseswitches, Distribution Boards, Fuses, etc., to the highest standards of electrical engineering practice, ensuring quality with economy.

DENNIS

SWITCHGEAR

Ask for Catalogue MC4

HEAVY DUTY FUSE SWITCHES

800 amps. TP and N Fuse Switch from our heavy duty 'CH' range (60 amp-800 amp), tested to 50 MVA. Catalogue No. CH380N.

G. P. DENNIS LTD., SPEKE, LIVERPOOL 24 TELEPHONE: HUNTS CROSS 2241 (5 lines)

LONDON OFFICE: 417 GRAND BUILDINGS, TRAFALGAR SQUARE GLASGOW: 125 WEST REGENT STREET

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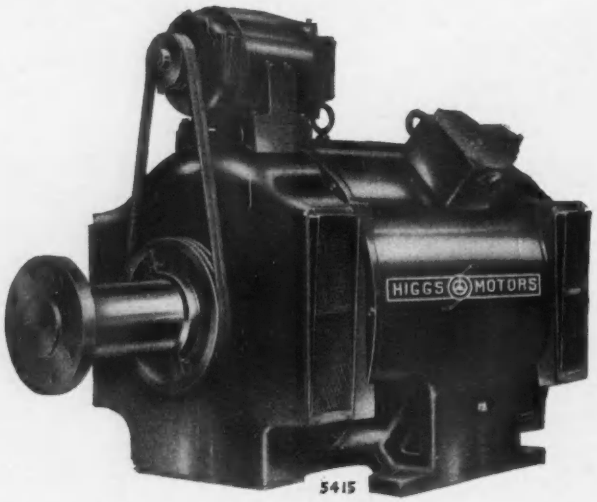
HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

BIRMINGHAM 6 ENGLAND



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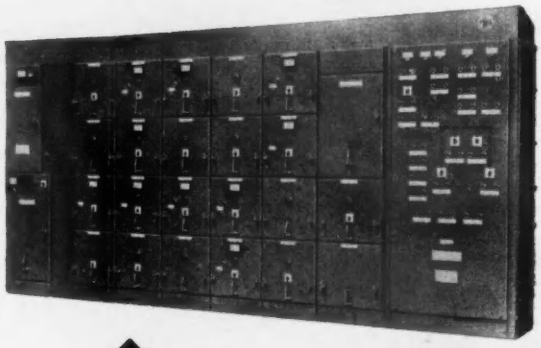
BELFAST BRISTOL CARDIFF DUBLIN DUNDEE GLASGOW HULL LEEDS LIVERPOOL
LONDON MANCHESTER NEWCASTLE PETERBOROUGH SHEFFIELD WOLVERHAMPTON

SPECIFY WECO CONTROL GEAR & SWITCHGEAR FOR MEDIUM VOLTAGE INSTALLATIONS

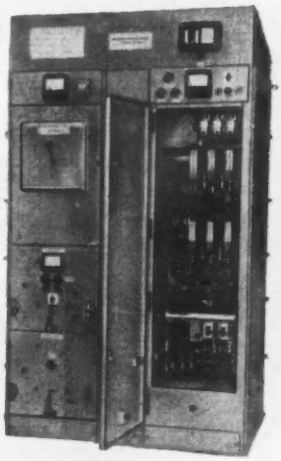


MOTOR STARTER BOARD & CONTROL PANEL

Typical of Starter Boards for use in material handling plants where machines require to be started in sequence by semi-skilled operators.

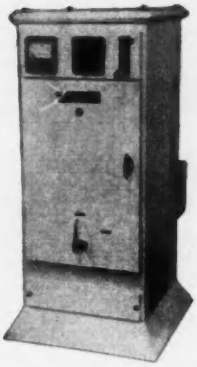
WAGON TIPPLER CONTROL BOARD

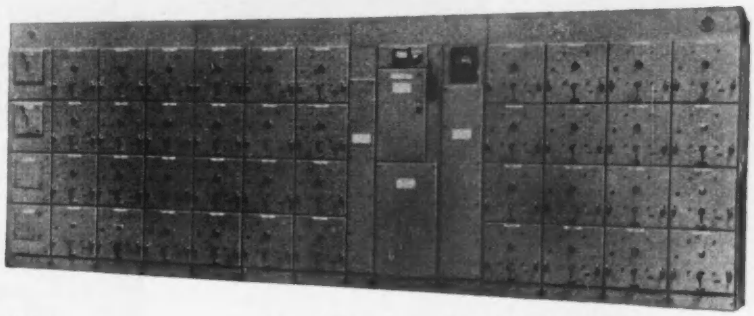
Tipplers and similar machines requiring reversal are frequently controlled automatically or semi-automatically. This Unit is for semi-auto operation of a 60 H.P. Tippler with Thruster Control built into the main Starter.



CIRCUIT BREAKER DISTRIBUTION SWITCHBOARD

Medium voltage Circuit Breakers required for distribution are available in Two Tier formation as shown, up to 3000 amps. Earth Leakage and other features may be incorporated.





DISTRIBUTION PILLAR UNIT

Type D.59 Circuit Breaker Units are available as shown, together with a range of Motor Starters. These Units can also be supplied in Switchboard formation.

MOTOR STARTER CONTROL BOARD

Chemical processes etc. requiring control at the apparatus frequently call for control Gear located away from the plant. This is typical of Units supplied for this purpose.

THE WALLACETOWN ENGINEERING CO. LTD.
VIEWFIELD ROAD AYR, SCOTLAND
TELEPHONE AYR 64618-9 'GRAMS "WALENCO, AYR"

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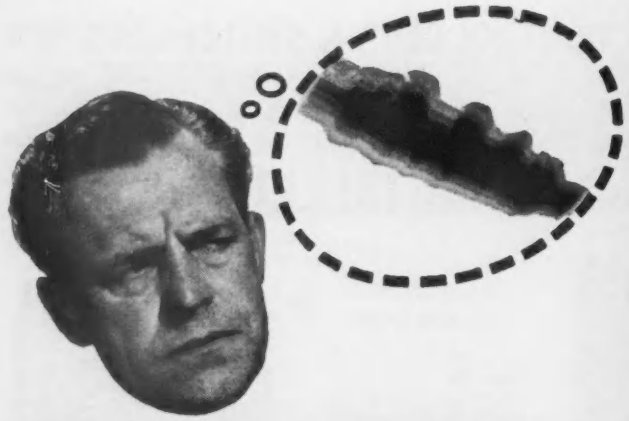

DISTRIBUTION PROBLEM?

A HENLEY Straight Through Joint Box for P.I.L.C. and armoured Cable up to 11,000 volts

Just think of the equipment with the AEI name behind it!

Distribution pillars and panels—Underground disconnecting boxes, branch boxes, service boxes and straight-through joints—Indoor and outdoor terminal boxes—Indoor and outdoor service fuses—H.T. and super-tension joints and sealing ends—Overhead service accessories—Rising mains systems—House service fuses and consumers' control units—Jointing materials and accessories of every description.

AEI CABLE DIVISION

Associated Electrical Industries Limited

DISTRIBUTION EQUIPMENT SALES DEPARTMENT

145 Charing Cross Road · London WC2 · *Tel: GERrard 8660*

NEWS SHEET

Supercritical pressure chosen for 375 MW sets. CEGB to order two sets for 3,500 lb/sq in., 1,100°F t.s.v., with reheat to 1,050°F. Contracts to go to AEI, Babcock and Wilcox, English Electric and International Combustion for Drakelow C. (227, 236)

Supply industry manual grades differentials increased by pay award, wage structure simplified by reduction from 108 to 7 classes. Increases range from minima of 3d/hr for labourers, 3¼d for mates, 5d for craftsmen, total cost £6m. p.a. (254)

International standards can ruin exporting chances, warns J. A. Robbins in article calling for more support from industry on standards negotiating committees. National test houses an important stumbling block. (228, 249)

Worst-ever record of electrical accidents in mines, disclosed in Chief Inspector's report. Many accidents avoidable by exercise of more care and attention. (247)

Kelvinators remove price fixing from 4·6 cu ft refrigerator—but only because model is discontinued, says managing director. New policy will be three month deep freeze storage facilities in all models; RPM still to be supported. (254)

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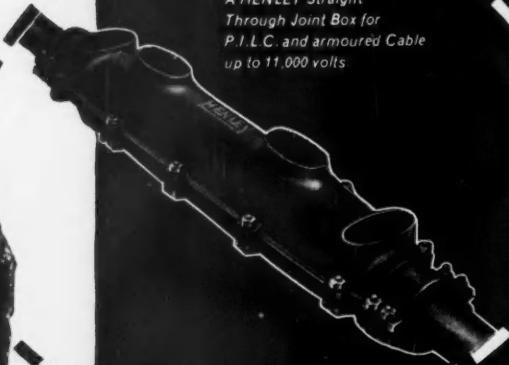

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NEWS SHEET

Lighting vital to sales in elaborate London showroom for wallpaper and fabrics. Unusual features include cold-cathode lighted stained-glass mural and specially designed display cases. (229)

Is it a fraud to reconnect a meter after it has been disconnected for non-payment of account? Some conflicting experiences from different parts of the country. (257)

Nottingham County Council confirm formal objection to Holme Pierrepont; says CEGB should justify green belt intrusion at public inquiry. But West Burton proposal not to be fought. (254)

Solar cells form energy source for 1912 electric brougham, focus attention on future prospects for the silicon solar cell. (247)

Register of bad payers opened by Hire Purchase Trade Association. Initial coverage Greater London and Home Counties. (256)

London-Midland Electrification unlikely to be finished by 1964, which was revised date of 1968 original estimate. First electric service Manchester-Crewe starts 12 Sept. (257)

Hydro board may propose Glen Nevis scheme, says board member. Only by such potentially profitable schemes can board finance uneconomic projects. (255)

Electrical stress relieving on welded 14 ton bridge girder successful by application of flexible heating mats regulated to planned heating/cooling cycle. Special lagging technique gives accurate temperature control. (245)

BUSINESS—George Kent propose one-for-one scrip issue on jump in trading profit . . . Nearly £1m. rise in trading profit by Thorn Electrical Industries, still expanding in fluorescent lamps . . . Dorman Smith Holdings also show substantial profit increase . . . But fall for Keith Blackman and Christy Bros. . . . Little change for Britannia Electric Lamp Works. (260)

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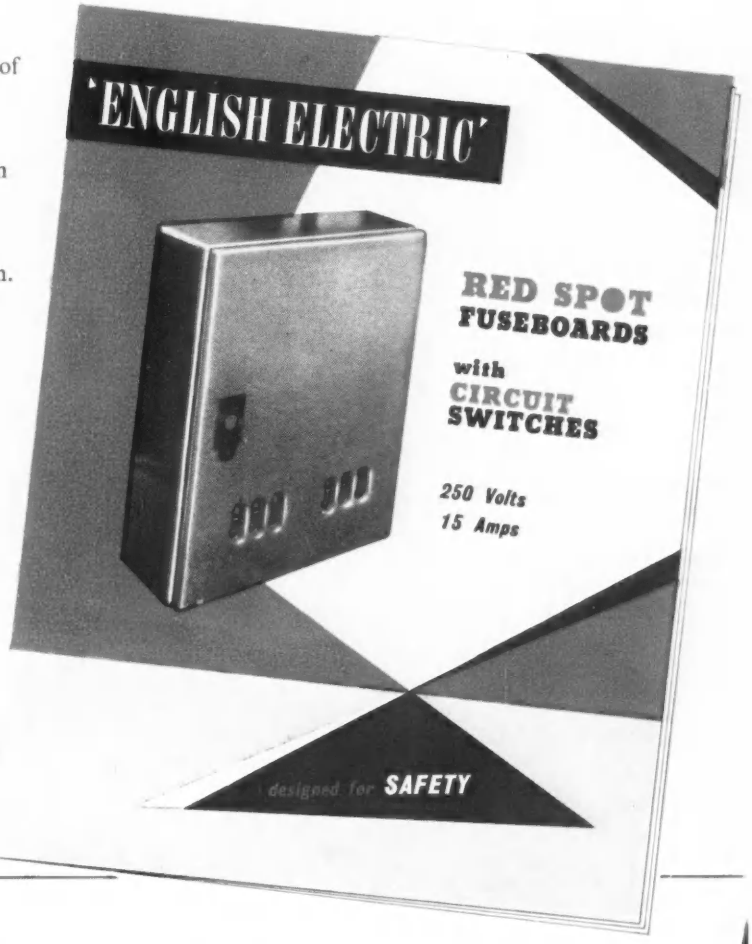
RED SPOT FUSEBOARDS

with built-in CIRCUIT SWITCHES

All the exclusive safety features of the well-known 'Red Spot' range of fusegear, **PLUS** built-in circuit switches, have been incorporated in this NEW design.

Available in both Single Pole & Neutral and Double Pole, with 4, 6, 8, 10 or 12 ways.
DELIVERY EX STOCK.



For further information write for PUBLICATION FG/147 to:

The ENGLISH ELECTRIC Co. Ltd.,
Fusegear Division,
East Lancashire Road,
Liverpool, 10

'ENGLISH ELECTRIC'

fusegear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

FG.42A

C

NEWS SHEET

Lighting vital to sales in elaborate London showroom for wallpaper and fabrics. Unusual features include cold-cathode lighted stained-glass mural and specially designed display cases. (229)

Is it a fraud to reconnect a meter after it has been disconnected for non-payment of account? Some conflicting experiences from different parts of the country. (257)

Nottingham County Council confirm formal objection to Holme Pierrepont; says CEGB should justify green belt intrusion at public inquiry. But West Burton proposal not to be fought. (254)

Solar cells form energy source for 1912 electric brougham, focus attention on future prospects for the silicon solar cell. (247)

Register of bad payers opened by Hire Purchase Trade Association. Initial coverage Greater London and Home Counties. (256)

London-Midland Electrification unlikely to be finished by 1964, which was revised date of 1968 original estimate. First electric service Manchester-Crewe starts 12 Sept. (257)

Hydro board may propose Glen Nevis scheme, says board member. Only by such potentially profitable schemes can board finance uneconomic projects. (255)

Electrical stress relieving on welded 14 ton bridge girder successful by application of flexible heating mats regulated to planned heating/cooling cycle. Special lagging technique gives accurate temperature control. (245)

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fusegear

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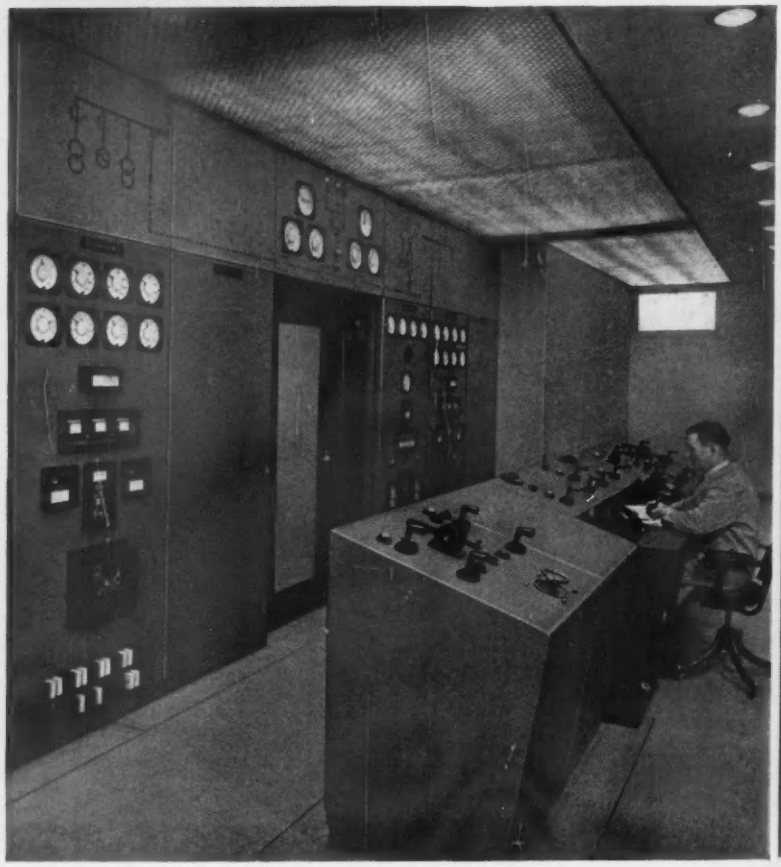
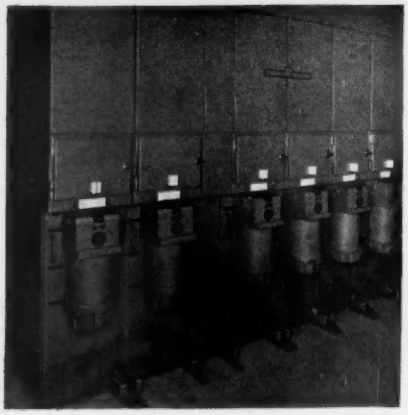
SWS

switchgear for modern industry



THE CLAYTON ANILINE CO. LTD. CHOOSE S.W.S. CONTROL ROOM EQUIPMENT & SWITCHGEAR

South Wales Switchgear Ltd. recently supplied all the control equipment, in addition to 6.6kV 250 MVA distribution switchgear and allied equipment, for The Clayton Aniline Company's new power generating plant. The plant comprises two 5·5 MW generators supplying a 6,600 volt power system.
This contract is typical of many carried out by S.W.S. Ltd. for the supply of switchgear, transformers and associated equipment to all branches of industry.



SOUTH WALES SWITCHGEAR LIMITED

BLACKWOOD · MONMOUTHSHIRE · WORKS AT TREFOREST AND BLACKWOOD

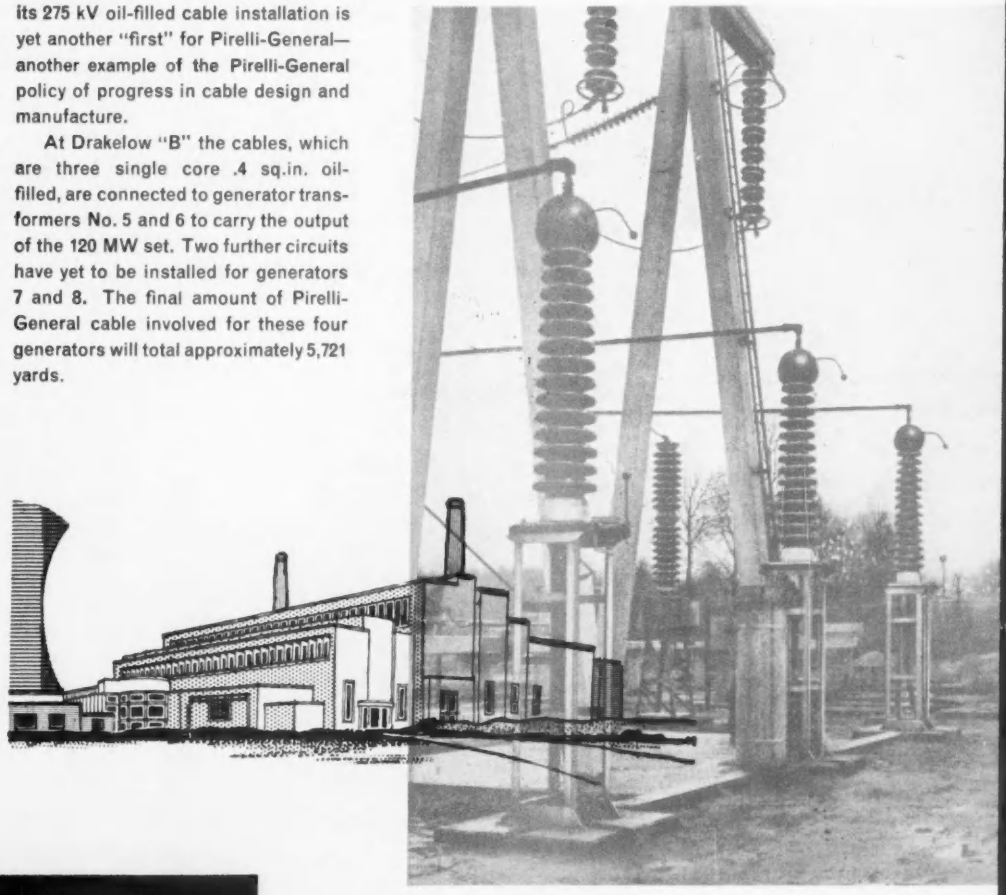
SWITCHGEAR · FUSE-SWITCHGEAR · TRANSFORMERS · CONTROL BOARDS

another pg *'first'*

Drakelow 'B' Power Station with its 275 kV oil-filled cable now in actual commercial operation

Drakelow "B" Power Station with its 275 kV oil-filled cable installation is yet another "first" for Pirelli-General—another example of the Pirelli-General policy of progress in cable design and manufacture.

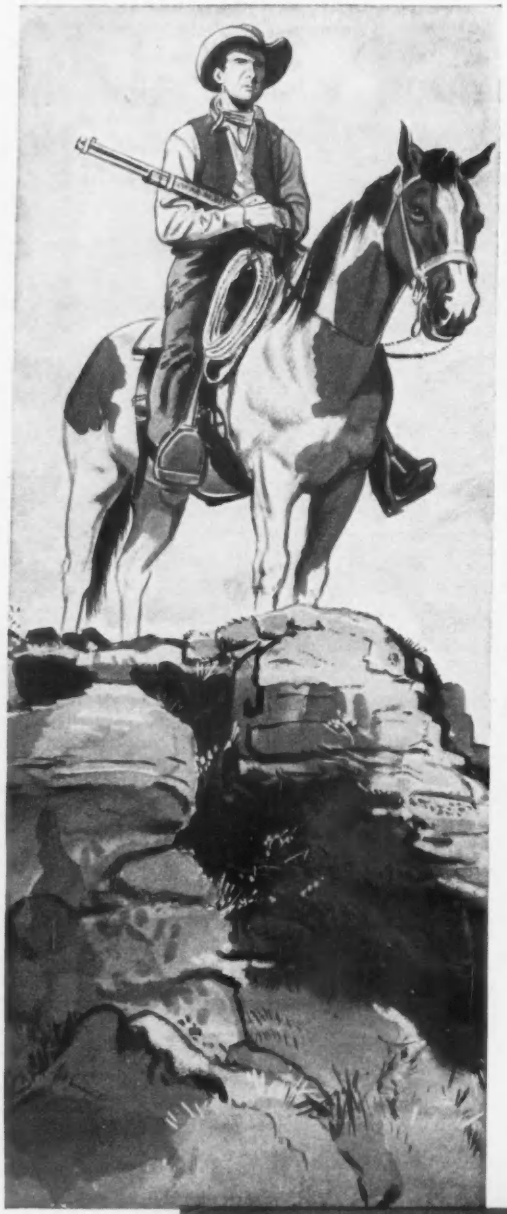
At Drakelow "B" the cables, which are three single core .4 sq.in. oil-filled, are connected to generator transformers No. 5 and 6 to carry the output of the 120 MW set. Two further circuits have yet to be installed for generators 7 and 8. The final amount of Pirelli-General cable involved for these four generators will total approximately 5,721 yards.



PIRELLI-GENERAL CABLE WORKS LIMITED

SOUTHAMPTON AND EASTLEIGH

just a man, his horse and his Winchester...



Just as the Pioneer of the Old West was dependent on his horse and his Winchester rifle, so today's up-to-the-minute contractor has learned to recognize the dependability of his Ramset Jobmaster tool. This is because the Ramset tool is a product of the Ramset Fastening System and was designed by Winchester-Western. With the backing of such experience, it is not surprising that the Ramset Jobmaster is acknowledged as the premier tool of its kind on the market to-day—the only powder actuated fastening tool that is 100% Safe–100% Sure.

ONLY RAMSET OFFERS ALL THESE PRODUCT FEATURES AND SERVICES

* Complete safety with Flite Chek
* Lifetime guarantee on tools
* 100% Warranty on all Fasteners
* Same-day service and supply to site
* Free technical advice and operator training scheme
* Full range of fasteners and attachments to tackle every fastening job.

Ramset products are obtainable only from the Manufacturers or through their appointed dealers.

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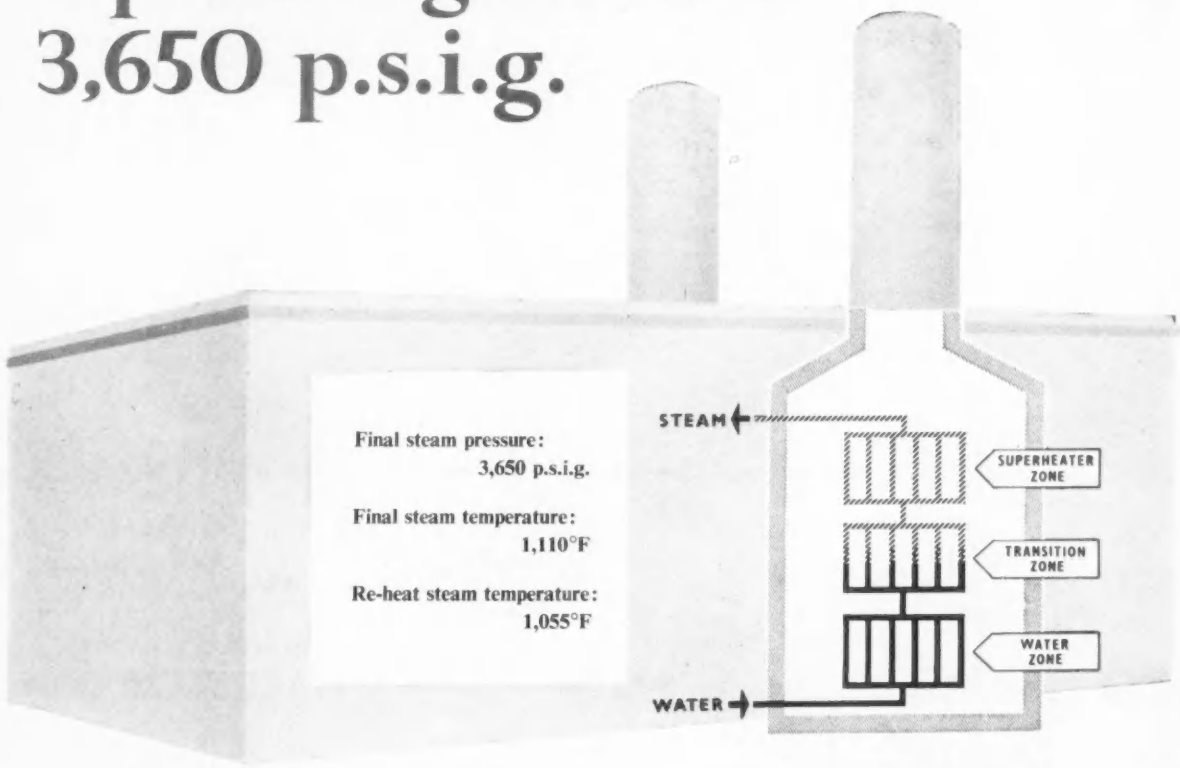
Ramset
FASTENERS LIMITED

Write or phone 788a Finchley Road, NW11 SPEedwell 9411 or 8004

NOW-a 375 MW Super-critical boiler unit Operating Pressure 3,650 p.s.i.g.



INTERNATIONAL COMBUSTION—SULZER MONOTUBE STEAM GENERATOR

This unit has been selected by the Central Electricity Generating Board for installation at Drakelow 'C' Power Station. The design is based on extensive research and development to meet the stringent operating conditions with maximum reliability and efficiency. International Combustion Limited and Sulzer Bros. are proud to be associated with this further stage in the Central Electricity Generating Boards' development programme, involving boiler units to operate above the 'critical' pressure of 3,206 p.s.i.a.

IC INTERNATIONAL COMBUSTION LIMITED

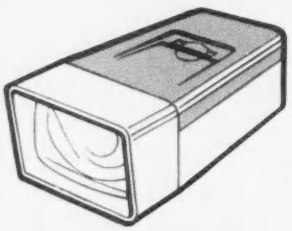
NINETEEN WOBURN PLACE, LONDON, W.C.1. TELEPHONE: TERMINUS 2833
WORKS, DERBY

Member of Atomic Power Construction Limited. One of the British Nuclear Energy Groups.

TGA. G141

TAKE A GOOD VIEW!

18 mouldings-just one fixing screw



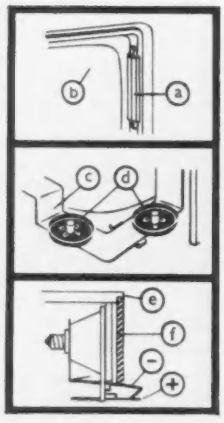
Keen on photography? Next time you pass a photographic shop look at this brilliant, new, colour-viewer by Johnsons of Hendon Ltd. As a photographer you will appreciate its undoubted efficiency and the advantages of its variable magnification. The ingenious arrangement for holding the slide in position also closes the electrical circuit to provide illumination without resort to finger-pressure or a switch.

As a plastics engineer or user, you will be impressed by the superlative finish of the two-colour injection mouldings, the single fixing screw and the unique way the lenses have been secured. We co-operated in the design, made the tools, produced the mouldings and handled assembly and packaging. Our associate company the British Optical Lens Co. designed and produced the glass lens system.

The wedge (a) holds the lens (b) in position securely, yet allows for minor alignment adjustments.

Electrical contact strips (c) are attached by metal fasteners (d) which clip over plastic pins.

The overlapping ledge (e) holds the slide (f) in position and simultaneously completes the electric circuit.



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THE PLASTIC MOULDERS WITH THE ENGINEERING BACKGROUND

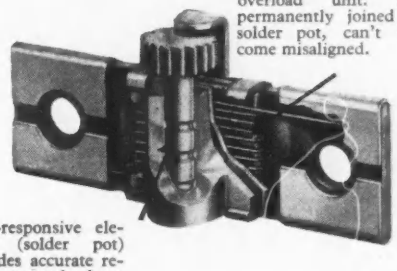
315 SUMMER LANE, BIRMINGHAM, 19

Telephone: ASTon Cross 1156/7/8/9

ONLY SQUARE D STARTERS WITH 1-PIECE OVERLOAD RELAYS GIVE *Complete* PROTECTION

Only Square D makes thermal overload relays with 1-PIECE construction—and only with 1-PIECE construction can you *know* you've installed the heater correctly. Square D 1-PIECE overload relays can be installed only one way. They are factory-assembled, individually tested and calibrated, completely tamper-proof. Repeated tripping will not affect accuracy.

You *pay* for overload protection—be sure you get it. Insist on Square D 1-PIECE overload relays for *complete* protection.



Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

You PAY for overload protection Be sure you get it!

Mail coupon to-day for simple "jig-saw" demonstrator—see why only Square D gives complete protection.

SQUARE D LIMITED, Cheney Manor, Swindon, Wilts.

Please send me information on Square D magnetic starters, along with your simple 3-minute "jig-saw" demonstrator.

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LEADERS IN CONTROL GEAR FOR OVER 50 YEARS

Square D products are stocked by leading electrical wholesalers throughout Great Britain

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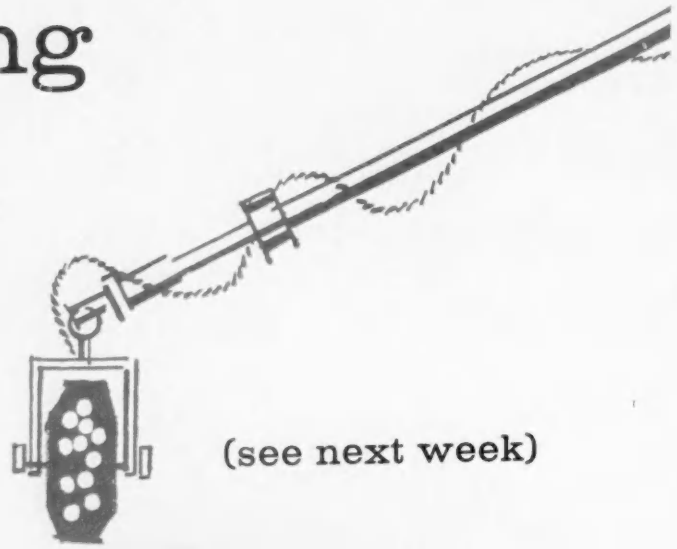
FIELD OFFICES: LONDON · BIRMINGHAM · MANCHESTER · GLASGOW · NEWCASTLE · BRISTOL · LEEDS

It's going to be a bit of all light!



(see next week)

Osram

OSRAM LAMP DIVISION G.E.C.

BABCOCK

ONCE-THROUGH "SUPERCRITICAL" BOILER

for

DRAKELOW 'C' POWER STATION

DRAKELOW 'C' will be the first Central Electricity Generating Board power station to be equipped with boiler plant operating at supercritical pressure.

The boiler to be supplied by

BABCOCK & WILCOX LTD.

will comprise a 'once-through' unit, pulverized-fuel fired, with an evaporation of

2,500,000 lb./hr.,

with steam conditions of

3,650 lb./sq.in. (s.o.p.)

1,110°F

AND REHEAT TO 713 lb./sq. in., 1,055°F, to steam a

375 M.W. GENERATOR

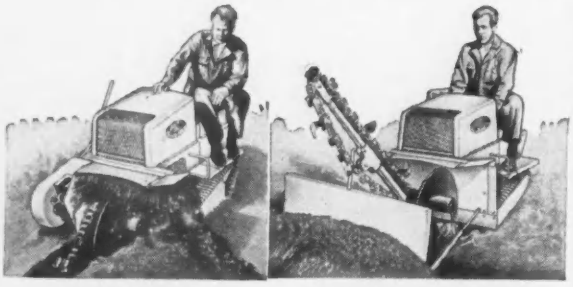
This Company, which is able to draw upon a considerable experience of supercritical-pressure boiler plant in other Babcock installations, is proud to be in the forefront of this important advance, with its potentiality for valuable increases in power station overall thermal efficiencies.

BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, LONDON, N.W.I

IT'S HERE

The trencher you've been waiting for

The ALLEN 3/12



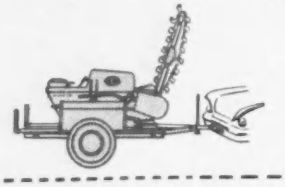
DIGGING **BACKFILLING**

This versatile small trencher and backfiller will dig trenches 3" to 4" wide, down to 5' 6" deep, or 12" wide to 2' 6" deep, with a range of intermediate width and depth capacities. The digging boom is controlled hydraulically, and can be telescoped to suit the depth of trench. It is powered by a 12½ h.p. 4-stroke engine.

The **ALLEN 3/12** is ideal for builders, plumbers, public works contractors, telephone, water, gas and electrical undertakings, etc., and offers speedy, low-cost, mechanical trenching and backfilling for an almost endless variety of jobs.

The **ALLEN 3/12** is approximately 6' 4" long, 3' 1"wide, 3' 1" high and weighs 1,350 lbs.

For transportation from site to site, a specially designed trailer is available, with tilting platform for easy loading.



Fill in and post the coupon below for full details of this superb machine.

ALLEN

To: JOHN ALLEN & SONS (Oxford) LTD COWLEY, OXFORD, ENGLAND

Please send full details of the ALLEN 3/12 Trencher

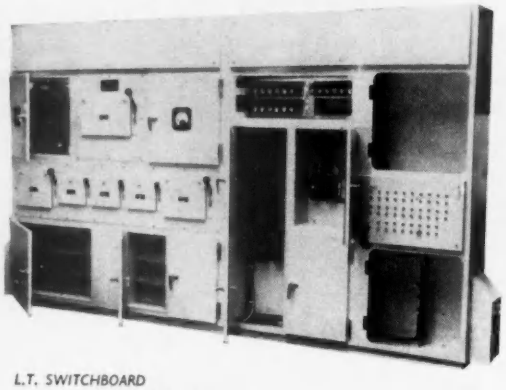
Name .....

Address .....

9 ..... Tel. .....

PACKAGED

Plant Control



L.T. SWITCHBOARD
FUSEBOARDS
STARTERS & RELAYS
HAND - AUTO CONTROL - INDICATION

ALL IN ONE PANEL

CHRISTY BROS. LTD.,
CHELMSFORD ESSEX.
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ENJOY YOUR -TA

KNOWING THIS SWITCH HAS BEEN LIFE TESTED TO 19 MILLION OPERATIONS

When it MUST be RELIABLE and you need something more ROBUST than a micro-switch—this MINIATURE HEAVY DUTY LIMIT SWITCH may be what you're looking for

- **CHANGE-OVER CONTACTS**
- **QUICK MAKE AND BREAK**
- **RATING** 2 Amps 250v } A.C. 1 Amp 500v } Inductive
- **MEASURES** 3¼"x2¼"x1¼" only

37/6 *Subject to usual discounts*

CONTACTOR SWITCHGEAR LTD.,
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AMERICA orders testing equipment from FERRANTI LTD

A 14,000kVA A.C. High Voltage Cable Testing Equipment which will be the largest ever made in the United Kingdom has been ordered by the Anaconda Wire and Cable Company, Hastings-on-Hudson, New York, U.S.A. It will be used for routine production testing of cable up to 250,000 volts. The value of the order exceeds 250,000 dollars.
Ferranti Ltd. have specialised for many years in the manufacture of A.C. and D.C. Testing Equipments up to 1,000,000 volts and of Impulse Generators up to 4,000,000 volts.

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Pioneers of the Electrical Industry with over 75 years' experience in research, development and manufacture

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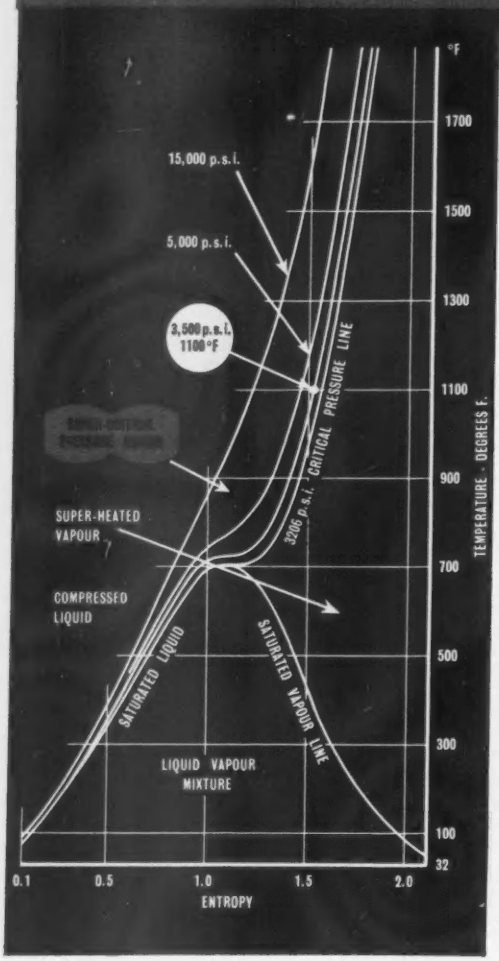
FT 236/2

1960 ANOTHER MAJOR STEP FORWARD

NOW 375 MW SUPERCRITICAL



The ENGLISH ELECTRIC Company Limited has received instructions from the Central Electricity Generating Board to put in hand one of two 375 MW single-line turbo-generator sets for operation at 3,500 p.s.i.g., 1,100°F., re-heating to 1,050°F.

The sets are for the Board's new Drakelow C Power Station and the No. 11 machine for which instructions have been given to 'ENGLISH ELECTRIC' is planned to commission in 1965.

This event marks the Company's pre-eminent position in the development and manufacture of advanced steam turbo-generating plant as shown by the orders placed with 'ENGLISH ELECTRIC' for the earlier prototype machines:

1959 **First 350 MW 2,300 p.s.i.g., 1,050°F., 1,050°F. re-heat**
1958 **First 275 MW 2,300 p.s.i.g., 1,050°F., 1,050°F. re-heat**
1955 **First 200 MW 2,350 p.s.i.g., 1,050°F., 1,000°F. re-heat**

'ENGLISH ELECTRIC'

steam turbines

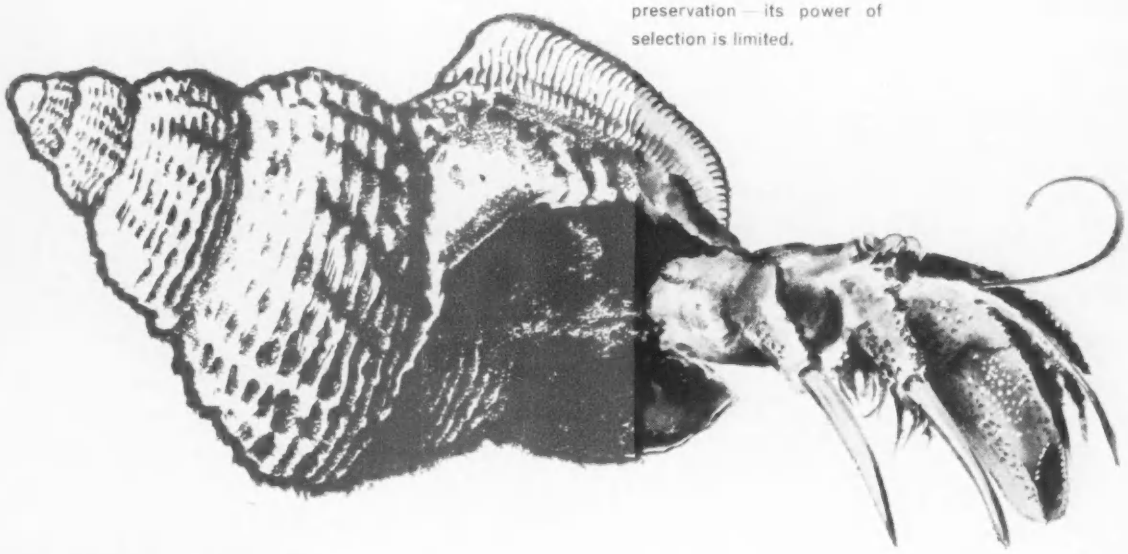
THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2.

Steam Turbine Division, Rugby

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

ST.40

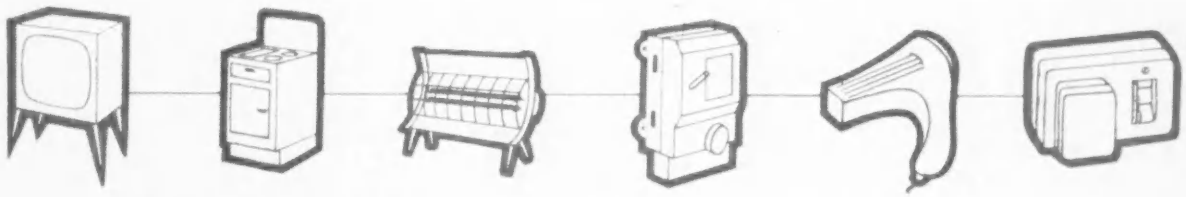
The Hermit-Crab has to seek its own shield against danger. It occupies an empty shell but has to move to larger ones as it grows. The Hermit-Crab obeys instinct in its search for self-preservation — its power of selection is limited.



PORCELAIN ...THE PERFECT PROTECTION

Man has at his disposal all the materials science can produce for protection against the dangers of electricity — but he still finds that nothing can compete with the insulation properties of ELECTRO-CERAMICS and PORCELAIN in particular. Completely reliable under varying conditions of operation, ELECTRO-CERAMICS never deteriorate and are the most versatile and economical answer to problems in every sphere of design.

Designers are invited to make full use of the combined resources of Britain's twelve leading manufacturers whose services are offered throu„h B.E.C.M.A.



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BRITISH ELECTRO-CERAMIC MANUFACTURERS' ASSOCIATION, FEDERATION HOUSE, STOKE-ON-TRENT

Breakdowns mean loss of production

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BREAKDOWN SERVICE
FOR WINDING WIRES
is always ready to help in an emergency

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Astralecon ... THE NEW ALUMINIUM-BUSBAR TRUNKING SYSTEM

1. An entirely new design backed by many years' experience of manufacture of Busbar Trunking.
2. Lightweight, over 25% lighter than conventional equipment without loss of strength (8¼ lbs./ft. run).
3. Of minimum size yet complying with B.S.S. standards for clearance and temperature rise.
4. Exceptionally attractive appearance.
5. Fuses and Neutral Link plug direct on to Busbar.
6. Side access for ease of installation and maintenance.
7. Generous cabling facilities to Tap Off Box.
8. Reduced headroom requirements.
9. Packing and C.I.F. charges slashed.

The ASTRALECON Busbar Trunking System, exclusively manufactured by Astral Switchgear Ltd., is designed to meet the demands of discriminating Engineers, Contractors and Users.

May we send you a copy of Publication No. 68.

WINS ON PRICE TOO

400 AMP TPN

for as little as

£1.6.9. net

per foot run.

Delivery ex-stock.

ASTRAL SWITCHGEAR LIMITED ASTRAL **ENFIELD, MIDDLESEX. TELEPHONE HOWARD 2033**

If you have a marking problem . . .

REJAFIX

is the answer

The wide range of REJAFIX machines are acclaimed as the most universal and reliable overprinters in the world today. Designed during years of study and research and manufactured to precision standards, they now cover a comprehensive range of Industries and Trades. We invite you to write and ask us to solve your marking problems—economically, efficiently and completely. This month we show you another example from our range, the

COLOUR BAND PRINTING MACHINE

- For colour coding and lettering on small components such as fuses, resistors, etc.
- Up to 5 colour bands together with one line of print.
- Extremely simple and foolproof to operate.
- Hand operated up to 500 per hour (illustrated). Power model up to 1,500 per hour.

REJAFIX MACHINES ARE USED BY LEADING MANUFACTURERS OF

Radio, Electrical & Electronic Components, Pens, Pencils, Paints, Brushes, Rubber Goods, Hacksaw Blades. REJAFIX products are backed by over forty years' specialised experience. Only genuine spare parts, ink, type, etc. supplied by REJAFIX should be used.

REJAFIX LIMITED **81-83 FULHAM HIGH STREET LONDON S.W.6** **Tel. RENown 5802/3/4**

Flashover photographed in air—instead of under oil—for purposes of illustration.

Moment of truth

What's the rating? 66 kV. Under oil? Yes. What did we get under oil? Flashover at 225 kV. Right, this one in air. Got it connected, earth lead on? Switch on. Up to 40 . . . 60 . . . 70 . . . 80 . . . 90—still holding. Now 95 . . . 100 . . . 105. Over she goes! Over 50% above rating in air. Design's all right, then. Should be, after all—it's by our own people. They know Permali, and how to use it. What's next for high voltage test?

PERMALI

INSULATION

Totally tested...

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ELECTRICAL TIMES

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Dans ce numéro

Eclairage de Salon d'Exposition 229

Un système complexe et soigneusement étudié d'éclairage met en valeur des papiers peints et des tissus dans un salon d'exposition récemment terminé à Londres. La souplesse de l'installation est assurée grâce à un système de distribution principal complexe. On a utilisé dans une très grande mesure des plafonds lumineux, des éclairages spéciaux des projecteurs. Une composition murale en vitrail, éclairée de l'arrière par des tubes à cathode froide est d'un effet saisissant. Cette composition mesure 10 mètres sur 6,50 mètres.

Groupe Générateur à Pression de Vapeur Surcritique 236

On doit installer deux groupes générateurs de 375 MW fonctionnant à une pression de vapeur supérieure au point critique, à la Centrale de "Drakelow C", en Grand-Bretagne. Les chaudières à tubes d'eau nécessaires, seront conçues pour fonctionner à une pression de 256,6 kg/cm², et produiront 1.140 tonnes/heure. Ces turbo-générateurs à une seule ligne d'arbres fonctionneront dans les conditions suivantes:

Vanne d'arrêt—246,1 kg/cm², 593°C: avec resurchauffe à 566°C. En pleine charge, chaque chaudière brûlera environ 150 tonnes/heure de charbon.

Electricité Industrielle 241

Les détails de conception de la régulation des moteurs méritant une plus grande attention, incluent l'emplacement des bornes, la normalisation des dimensions des démarreurs, et une disposition spéciale pour atmosphères chargées de poussières. En ce qui concerne la protection des circuits de moteurs à courant alternatif, il est recommandé d'adapter les caractéristiques de fonctionnement des dispositifs de protection aux types de moteur. Un réglage rigoureux des dispositifs de coupure à maxima peut assurer la protection contre une tension légèrement basse. On a utilisé des éléments chauffants souples autonomes pour le traitement thermique d'une poutrelle de grande dimension destinée à un pont.

In dieser Nummer

Beleuchtung von Ausstellungsräumen 229

In einem kürzlich in London fertiggestellten Ausstellungsraum kommen Tapeten und Gewebe mit Hilfe eines sorgfältig durchdachten Beleuchtungssystems voll zur Geltung Eine sinnreiche Auslegung der Hauptverteilungsleitungen bietet vielerlei Schaltungsmöglichkeiten. Von Leuchtdecken, Vitrinenbeleuchtungen besonderer Ausführung und Scheinwerfern wird weitgehend Gebrauch gemacht. Imponierend wirkt ein in Farbglas ausgeführtes, 10 x 6,5 m messendes Wandgemälde, das von hinten mittels Kaltkathodenröhren beleuchtet wird.

Generatorsatz für überkritische Betriebsdrucke ... 236

Zwei Generatorsätze mit einer Nennleistung von 375 MW, deren Betriebsdruck oberhalb des kritischen Druckes liegt, werden demnächst im britischen Kraftwerk "Drakelow C" aufgestellt. Hierzu sind Dampfkessel mit direktem Durchsatz erforderlich; im vorliegenden Falle sind solche für einen Betriebsdruck von 256,6 kg/cm² mit einer Verdampfungsleistung von 1 140 t/h konstruiert worden. Die Beaufschlagung der einwelligen Turbogeneratoren erfolgt mit einem Dampfdruck von 246,1 kg/cm² bei 593° C am Schieber, mit Nacherhitzung auf 566° C. Bei Vollast beträgt der Kohlenverbrauch jedes Dampfkessels etwa 150 t/h.

Elektrotechnische Notizen für die Industrie 241

Zu den Neuerungen auf dem Gebiete der Motorensteuerung, die erhöhte Aufmerksamkeit verdienen, gehören Vorschläge zur Klemmenanordnung, Bestrebungen zur Normierung von Anlassergrössen und Sonderkonstruktionen für Betriebe mit staubbeladener Atmosphäre. Bei Wechselstrom-Motorenkreisen empfiehlt es sich, die Betriebseigenschaften der Schutzvorrichtungen denen des jeweils verwendeten Motors anzupassen. Durch knappes Einstellen der Ueberstromrelaiskontakte lässt sich ein wirksamer Schutz gegen geringe Unterspannungen erreichen. Zur Vergütung einer schweren Brückentraverse wurden biegsame, in sich abgeschlossene Heizelemente verwendet.

Accent on Display 229

Instrumentation in Industry 234

C.E.G.B. Goes to Supercritical 236

INDUSTRIAL ELECTRICITY

Attention to Design Details Can Help Maintenance 241
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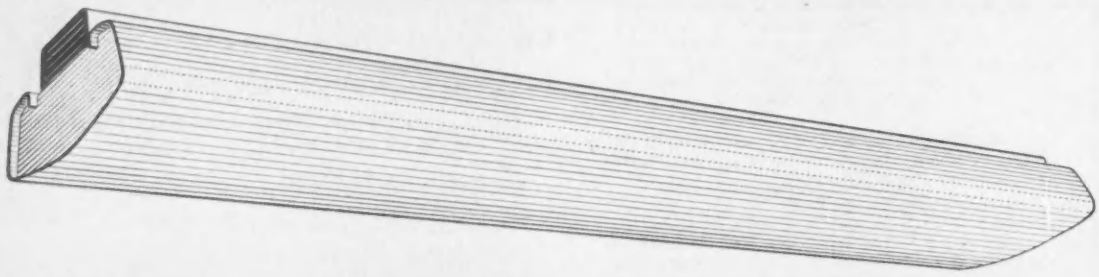
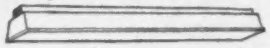
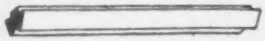
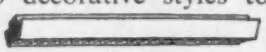
how multi-use units make planned lighting pay



Perhaps because light bills show red on the balance sheet, businessmen tend to view lighting as 'loss'. Yet today Atlas makes it an asset, a *positive* factor,  a means of saving both time and money. Look at **atlas atlantic.** Here, with only one standard chassis, you can plan a complete lighting installation, *with the right kind of light for every department.* One basic unit, endless variations. One basic unit, low-cost installation. One basic unit, high-speed maintenance.  And the features of **atlas atlantic** are in many respects unique . . . as one would expect of Britain's finest range of pre-assembled, multi-use fluorescent fittings. Sizes available are 8 ft., 5 ft. and 4 ft., with single or double tubes. The range of interchangeable diffusers and reflectors provides the widest possible choice of fittings, from superb decorative styles to production line trunking.  **atlas atlantic** brings better lighting (and so increased efficiency) to every size and type of business, without the extra cost of 'special' fittings for every different purpose.

atlas atlantic

flexibility in fluorescent lighting.

Atlas Lighting Limited, Thorn House, Upper St. Martin's Lane, London WC2

DTV

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 18 AUGUST, 1960

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Comment

JUMP TO SUPERCRITICAL

Higher steam pressures and temperatures are the usual way to better thermal efficiency and so more economic generation. Thus the CEGB's choice of supercritical pressure and a 50°F hoist in t.s.v. temperature for its latest large sets is in the continued path of progress. Yet the move to supercritical has been taken only after some hesitation, for it introduces many new problems for plant designers notably in its demand for once-through boilers without a steam drum in the normal sense. With adherence to the unit-boiler-turbine principle maintained, this means building a once-through boiler for 2,500 klb/hr steam output, a much larger unit than the supercritical designs that have been developed in Europe and in this country, largely for combined power and process steam work. Two boilermakers are being given the opportunity of developing designs, and two turbine firms the chance of producing the accompanying sets. These are notable for being the largest tandem-compound machines yet planned, their 375 MW comparing with the 350 MW rating of the subcritical pressure sets that will complete the complement of Drakelow C station. Of course, the supercritical installation is in its essentials a major development project, although the £15,000,000 extension will have to play its full part in the generation programme. It has as its target a jump in thermal efficiency to around the 40% mark, and this, for the first time for many years, will have to be purchased at the cost of increased expenditure for kW of plant; the size effect has for some years offset increased materials and equipment costs inherent in advancing steam conditions. By the time the sets are commissioned, in 1965, there will be substantial nuclear capacity in the system, so full two-shift flexibility will have to be built in. If the nationalised supply industry at first seemed slow in its advance to big sets and higher steam conditions, its more recent progress has left no room for criticism on that score.

BONN ACCORD

Bridge building is always easier in clement weather, and the recent accord between Mr Macmillan and Dr Adenauer is being interpreted by those who look for a link between the European Six and Seven, more as the beginning of a Buchan dry spell than as a rift in the clouds. Nothing tangible has been achieved, and no matter how important may be this reaffirmation to press for a wider pattern of trading relationship, it is at the best a beginning. In the past, it is not between this country and Germany that the main divergence of views has arisen. France has been exhibiting more obstinancy than logic, and even the sager counsel of the

Six's elder statesman may be insufficient to overcome the youthful introversion of the new Hallsteinism. But we have to overcome it and what is more in a minimum of time. Despite the efforts of industry to think beyond the political barriers of the Six and the Seven, trade is already beginning to align to the new trading groups. Although for the first six months of this year total UK electrical exports rose by 4%, exports to ECM countries fell slightly; they now account for 10·1% of the total, compared with 10·6% for the first six months last year. More significant is the rise in electrical exports to EFTA countries which now account for 7·3% of the total, a substantial rise from 6% last year: the trade pattern was beginning to swing before the agreement was implemented. A new concept that emerged from Bonn last week was the possibility of a wider trading agreement embracing the Commonwealth. Such a move could have a substantial effect on the electrical industry, for this market takes well over 50% of UK electrical exports. But whatever weather is forecast by the new Anglo-German accord, no one doubts that the '60's will be a period of increasing overseas competition, and the electrical industry will have much to do to maintain its position in the van of the export drive.

STANDARDS IN EXPORTS

This is the age of protecting the consumer. The seller has to beware even more than the buyer. Mandatory standards which have to be met before equipment can be offered for sale are a prominent aspect of this climate of opinion. Though they are only now becoming familiar in the United Kingdom, they have been for years a feature elsewhere in the world. It is difficult for a country dependent on exports to have any direct effect on such national standards, but since the realities of international trading press the advantages of some co-operation to align standards, something can be done through international standardisation associations. But does British industry realise this sufficiently widely? The case for more attention to such negotiations is argued strongly by a contributor elsewhere in this issue, and there will be many who, like him, have taken part in international standards negotiations and who will feel a need for more backing from the industry as a whole if they are to hold their own around the committee table. When a standard is to be enforced by legislation, and perhaps subject to the interpretation of a legally recognised national testing station, the details loom as large as the essence, in deciding whether equipment will be judged to comply, or reckoned to be in contravention. Failure to meet the standard means no chance of sales in the market covered by the test authority concerned. It seems self-evident that it is worth insuring heavily against that risk, by sending substantial representation to all meetings where standards are thrashed out, but, in fact, the electrical industry has seemed loath to do this. Perhaps it thinks still in terms of a Commonwealth market largely committed to British practice. That position is changing. BEAMA has recently recognised explicitly the importance of ECM standardisation. It is in the interest of member firms and others to concern themselves urgently with it.

TASKS FOR INSTRUMENTATION

Lord Kelvin's epigram that to measure is to know is in these days of automation begetting a corollary, to measure is to control. It is on speedy measurement that the principles of automatic control depend, and the discussion of instrument progress in DSIR's Industrial Grants Committee's annual report is particularly appropriate to a survey devoted to the research associations, almost all of which are providing for members' growing interest in automatic control. In the discussion, the director of the British Scientific Instruments Research Association estimates that there some 200 types of measurement of industrial importance. Just how many are covered satisfactorily by the measuring devices available he does not say. Something can be managed for every case, but for some of the more complex quantities, such as moisture content, the degree of accuracy in instantaneous measurement that can bring the highest economy in industrial processes, is still lacking. It is, of course, a commonplace that much of the advance has come through refinement of electrical techniques, and notably from the more recent advances in electronics. Yet the vigour with which the director rejects any suggestion that electronic instruments are in any way the inferior of others, hydraulic and pneumatic, for example, will still come as a surprise to some instrument users. He castigates as simply "wrong" the belief that there is anything inherently unreliable about electronic techniques.

WHAT'S WRONG IN DETAIL?

Proving tests ensure that most industrial equipment does its main job satisfactorily before it is marketed; and if there is anything seriously wrong the purchaser is likely to complain about it vigorously. Less certain of being recorded is dissatisfaction with details of design. As a correspondent writing in this week's *Industrial Electricity* points out, it is frequently the maintenance engineer who finds that the design is not really suitable for a particular type of industrial atmosphere, or that adjustments prove to be frustratingly difficult on site. It is in the nature of the maintenance task that some means of overcoming the trouble should be improvised on the spot; and there the matter too often rests. Yet in some of the best organised maintenance schemes, those in charge exercise a good deal of persuasion to take it further. They urge on their wiremen and maintenance fitters the importance of reporting upwards the minor annoying shortcomings of equipment, especially where trouble is repeated many times, even though its correction be only a small job. Such information can help the user to purchase better gear and, if passed on, the manufacturer to make it.

Meteor

This week's quick summary of electrical news faces advertisement page 12

Accent on display

LIGHTING AN ESSENTIAL AT SANDERSON'S SHOWROOMS

ANY showroom presents a challenge to the lighting engineer, in achieving a subtle combination of general and local lighting without either being obvious or the equipment obstrusive. In the new showrooms of the well-known wallpaper and fabrics firm of Arthur Sanderson and Sons Ltd., however, was presented a lighting challenge both severe and stimulating; the problem of lighting a kaleidoscopic display of patterns and colours on the contrasting textures of paper and cloth not merely to show the qualities of the material but also to aid purchasers in choosing exactly the correct answer to their particular problems of domestic décor.

The Building

This new building, replacing earlier premises in Berners Street, London, and commemorating the firm's centenary year, is not only the largest for presenting decoration ideas and materials but also the fusion of a number of artistic talents, with Sanderson's own display and exhibition staff. The building itself was designed by Slater and Wren, F/F.R.I.B.A., whils Beverley Pick Associates were responsible for the interior showroom décor and display. John Piper and Patrick Reyntiens have combined to produce a stained-glass mural; Jupp Dernbach-Mayen created a glass and marble mosaic and an inner garden court. The lighting installation was designed in collaboration with the GEC, using fittings in the main, specially made for the purpose.

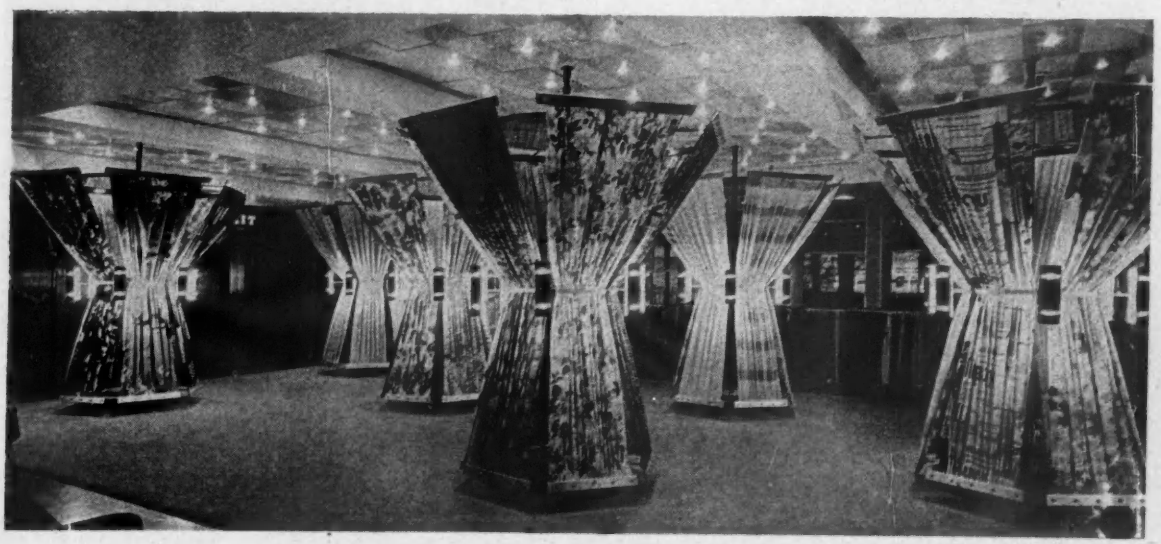
It is a building of reinforced-concrete frame supporting curtain walling and having a main block of 216 ft by 40 ft fronting on Berners Street in a N-S direction rising seven storeys above ground level, of which the first four are given over to the showroom. Two wings extend rearwards, the southern ten storeys high and the northern four, these are joined at the back at first- and second-floor levels by a bridge, or link area, the enclosed quadrangle forming the garden court. There is also a basement, given over to a large garage and the building's services.

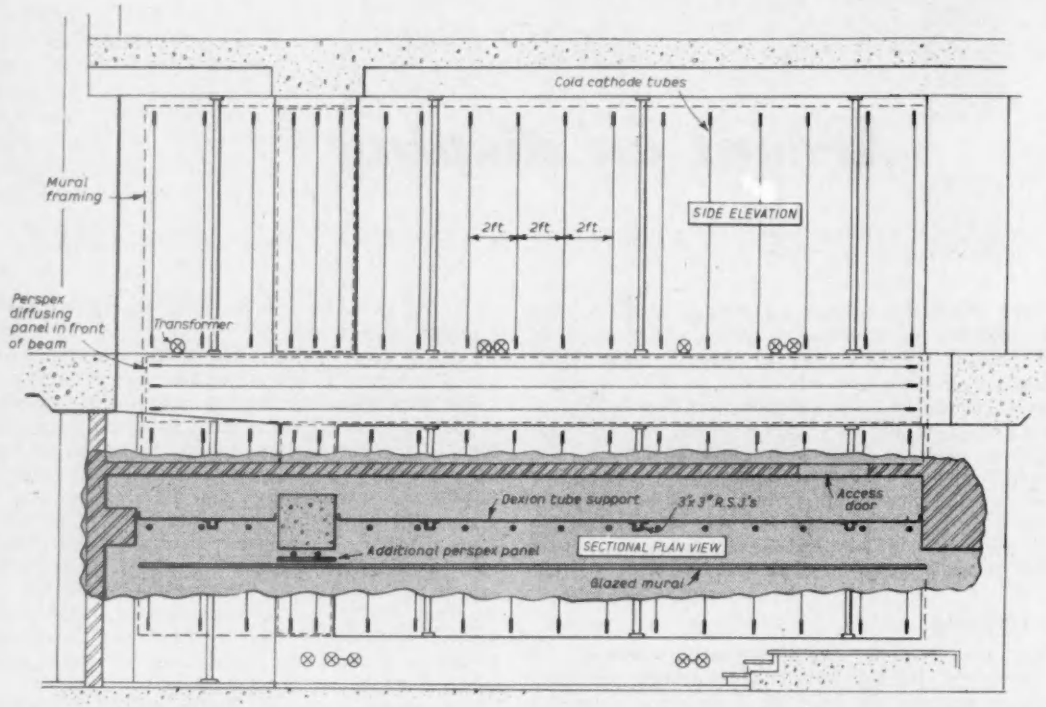
The display and its lighting makes its impact as early as the approach to the building, from the show window. Here is provided a microcosm of Sanderson fabrics and wallpapers in four displays, with their home-like setting suggested by casual chairs and coffee tables, over which pendant filament fittings are suspended at different heights. General lighting is provided by fluorescent lamps mounted above a ceiling of slotted plastics louvres, whose inclination can be adjusted (on the Venetian-blind principle) to vary the light falling on the scene below. In this way, the general illumination level of the window area may be varied to provide the background to local modelling achieved by the use of spotlight units.

The unusual idea of slotted louvres, this time in aluminium, is continued in the reception area, where a formal and quiet atmosphere has been created to contrast with the light and colour of the interior. This reception area lighting is achieved by means of deluxe warm-white cold-cathode fluorescent lamps housed in reeded Perspex diffusers above a slotted ceiling area. The lamps have been deliberately mounted non-uniformly above the slatting, which gives some variation in the luminances of the sides of the slats noticeable only when viewed obliquely but sufficient to destroy the monotonous appearance louverall ceilings seem usually to acquire.

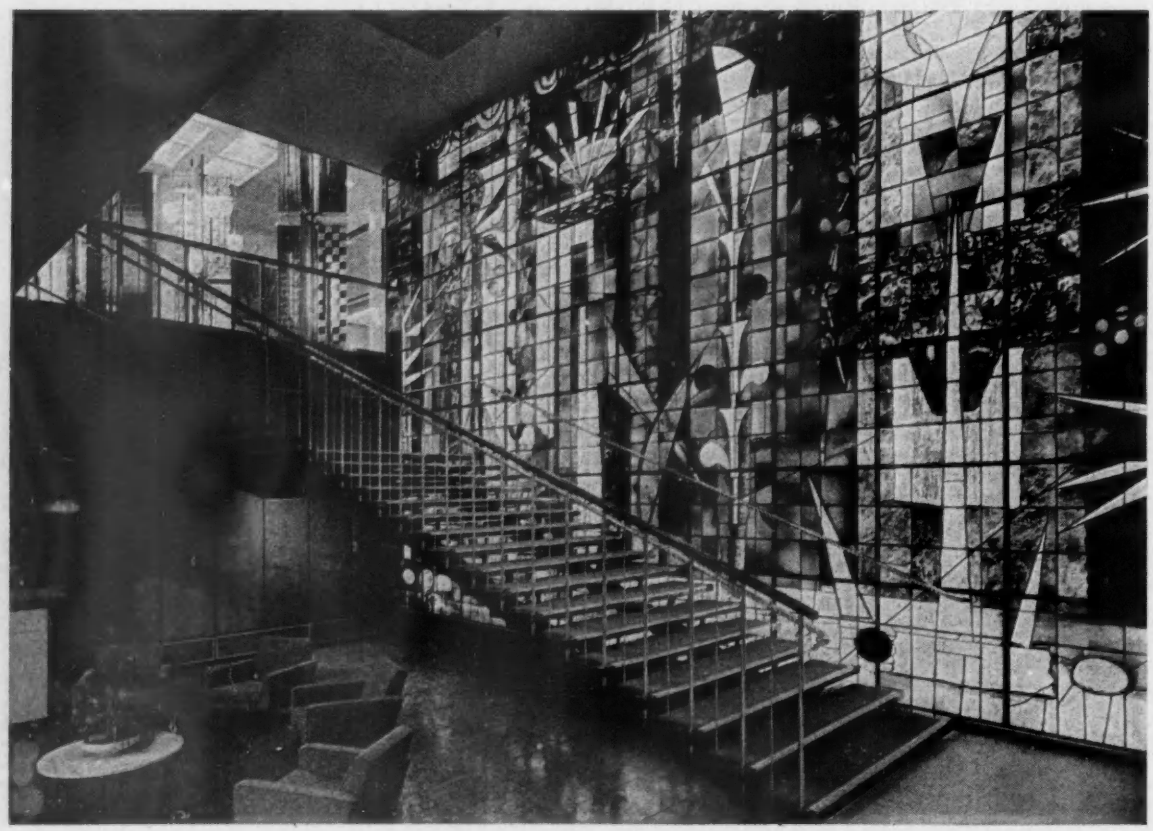
The most striking feature of the entrance area is, of course, the illuminated mural designed to symbolise the House of Sanderson living by design and colour. In size

Gay, fairground impression created by fabric display rondelles and star-effect ceilings





The theme of Sanderson's products enhancing their appeal through colour and light is symbolised by a stained-glass mural. Cold cathode tubes arranged to give the mural even illumination



32 ft wide by 21 ft tall, it fills the entire rear wall of the staircase well into which the reception area leads, rising behind the open staircase to the first floor ceiling.

Mural Lighting

An essential feature of the mural is that it is illuminated from behind by cold-cathode fluorescent colour-matching tubes, but in such a way as to give a completely uniform surface luminance to the $\frac{1}{8}$ in. opal Perspex sheet which backs the glass of the mural. In view, however, of the difficulties presented by structural beams behind the mural, the lighting problem was particularly severe and required a research laboratory study carried out in conjunction with the designers. The final arrangement was first erected in the workshops of Patrick Reyntiens so that the mural could be completed under actual site conditions.

To support the mural, which with metal frame, glass and Perspex weighs about 6,650 lb, vertical 3 in. sq rolled-steel joists were fixed between the ground floor and beam and between the beam and second floor, approximately 2 ft behind the mural face. To these joists were welded horizontal arms, carrying the mural framework of special stainless steel angle. The joists also support a Dexion-angle framework on which the cold-cathode tubes are mounted, these being sited about 18 in. behind the mural surface. Additional tubes were mounted directly on the faces of the beams and columns, and an additional opal Perspex sheeting fixed 3 in. in front of these tubes to provide the additional diffusion required to allow for their greater proximity to the front of the mural. The vertical edges of these inner Perspex panels are of saw-tooth form of 3 in. pitch, 60° angle, to avoid the abrupt discontinuity of a sharp edge.

The rear is enclosed by wood boarding, with doors to give access to the lamps and associated transformers which are placed in the cavity. In all, there is about 400 ft of cold-cathode lighting, amounting to some 3·75 kW, which has been divided to provide a balanced load across three phases and is contactor switched.

Main Display Areas

The first and second floors comprise the main display areas, the first being given over largely to wallpapers and the second to fabrics. From the design aspect, however, these floors have been treated as a single entity, the integrating features being the two-storey exhibition area and link bridge. Both floors are arranged as open-plan areas, particular sections being distinguished by suspended ceilings with different lighting treatment. Fluorescent lamps are "colour-matching" throughout.

The two-storey exhibition area is perhaps the most dramatic feature of the building, containing six display columns rising to the ceiling. Each column takes the form of four radial vanes, carrying two panels bearing a wallpaper or fabric on each side.

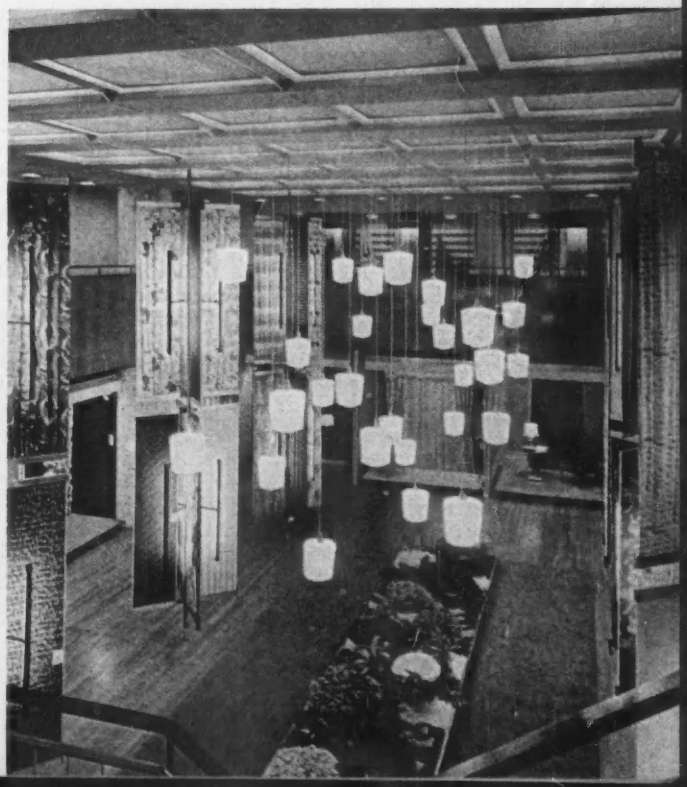
Alternating with the vanes round the column are vertical pairs of 4 ft 40 W fluorescent lamps, each highlighting the vane on each side of it. These lamps are housed in cylindrical reflectors, so slim as to be described more accurately as reflector tubes, which are supported on spokes attached to the centre column.

The columns are arranged in two rows of three enclosing an indoor garden, over which further decorative illumination is provided by 24 truncated-cone Chrysaline shades suspended at varying heights on white p.v.c.s. flexible. The square laylight apertures in the ceiling are closed by a combination of slats and "Paragrid-Tile" small-mesh plastics louvres, with a rectangular arrangement of 4 ft lamps installed in each aperture for night-time general lighting. This treatment is repeated in the link area, with decoration provided by suspended fittings.

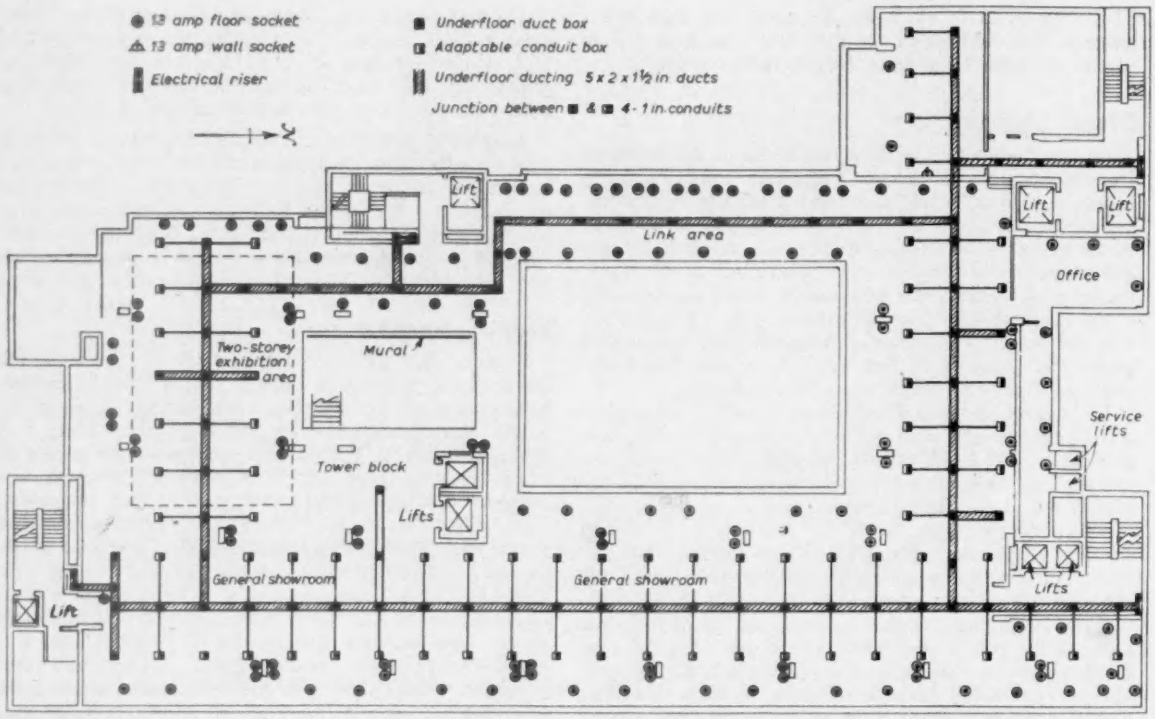
Round the perimeter of this display area are arranged nine miniature room settings in different styles, some with a "window" in the rear wall. A "Cycloramic" vista beyond the window is illuminated by means of fluorescent tubes concealed behind the rear wall; there is further "pelmet" fluorescent lighting from above the front of each room, most of which also have table lamps or floor standards.

Display Variety

Passing from the exhibition area to the front of the building, the methods of display, and of lighting, change. There are four, free-standing room settings in island fitments, also illuminated from front "pelmets" using 8 ft fluorescent lamps. The pelmets are perforated panels of brass-colour anodised aluminium. Facing these room settings are five double-sided display units, each comprising a ceiling-high wallpaper panel with a glassed-in showcase at one end. Above the wallpaper panel is a special fitting, having an aluminium frame 5 ft long by 2 ft 6 in. wide with two slender cross arms, and a visor of three glass panels fluted on their lower sides and etched with closely spaced lines on their upper sides. It encloses four 5 ft tubes. The showcase contains a "tree" display stand comprising a vertical tube with horizontal radial arms, some of which are used to carry 75 W internal-reflector spot lamps and the remainder supporting draped fabric. The ceiling in this display area is of acoustic tiles carrying circular recessed 100 W tungsten fittings with spill rings for general lighting. Beyond these display fittings are provided facilities for wallpaper self-service and here the main lighting feature is a 98 ft long aluminium frame carrying small-mesh "Paragrid-Tile" louvre and four lines of 8 ft lamps above. This is suspended over a length of carpeting to mark out a "corridor" on either side of which are placed small inclined tables for wallpaper pattern books and banks of large wallpaper screens. Local lighting for the tables is provided by means of three



Selective lighting fittings reveal fabric quality in the lofty exhibition area



Display demands an extensive underfloor duct system, with many risers and branches to the first-floor junction boxes

pendant tungsten fittings of polished brass and matt black concentric spinnings suspended on black p.v.c.s. flexible, and for the wallpaper banks by means of aluminium frames and reeded/etched glass panels, similar to those for the double-sided units but differentiated by means of vertical slot perforations in the sides of the frame.

Paint Panels Shown to Effect

The far end of the first floor features a paint display stand, J-shaped in plan, in which a number of vertical, square section tubes support radial arms carrying painted panels illuminated by reflector spot lamps on upper and lower arms. Nearby is the wallpaper sales counter, over which is a suspended ceiling slab with semi-recessed miniature-bulb filament lamps. The office area behind the counter is lit by fluorescent lamps, screened from the public side by means of a vertical diffusing screen. There is also a further 47 ft length of the small-mesh louvre "corridor-lighting" frame fitting.

On the second floor (devoted mainly to fabrics), the lighting and display techniques are repeated but in slightly different forms to avoid any suggestion of "sameness." The ceiling area along the front of the building and in the north wing is broken into recessed rectangular bays in which the familiar aluminium-frame fluorescent units with small-mesh louvres are suspended, to provide general lighting. On the window side of the area is a row of double-sided banks of fabric display screens (as for wallpaper on the floor below) with local lighting provided by means of aluminium-frame, reeded/etched glass units with three 5 ft tubes in each. A novel feature at the south end of the area are two fabric display frames in which individual fabric pieces are drawn out from the back to their full width by means of overhead pull-wires. The frame periphery carries a continuous fluorescent fitting, comprising a perforated brass plate on the outer side on which the tubes are supported, and a diffusing opal plastics L-shaped enclosing visor on the inner side. Other displays are provided by means of five miniature room settings, each unit comprising double-sided wall bisecting a carpeted platform and broken about one-third along its length to allow for a group of ten cascade tungsten fittings suspended at different heights on white p.v.c.s. flexible.

The most spectacular feature of the second floor are the six rondelles, reminiscent of small, stylised roundabouts. This effect is achieved by an hexagonal arrangement in which each of the fabrics is supported at its full 3 ft width from the top framework, gathered to form a "waist" and then flaired out at the bottom, allowing the pattern to be seen both fully open and ruched. At the "waist-line" six 3 ft tubular arms radiate from the centre column between adjacent fabrics to carry a cylindrical tungsten fitting throwing light on to the fabrics. The ceiling area over the rondelles is of rectangular chequer-board panels of dove-grey and white, each grey panel carrying at its centre a semi-recessed miniature-bulb filament lamp giving a star-light effect.

Wallpaper Sales Service

The third floor, designed for salesman service of wallpapers, provides individual pattern-book tables and display stands along the entire front of the main block, and along the back, to make maximum use of the daylighting. To provide a comparably high level of artificial lighting, a continuous fitting, 123 ft long, has been installed over this viewing area. This repeats the style of lower floors, in having aluminium frames and reeded/etched glass panels.

One other feature of special note is the main lighting unit for the trade showroom on the ground floor. This is a continuous fitting arranged to follow the outline, in plan view, of a cross whose arms are 10 ft long and 5 ft wide.

The fitting has a cross-section of a right-angled 60° triangle. The two sides bounding the right angle are of metal, the shorter side being vertical and the longer side facing the ceiling and providing the anchorage for suspension. The hypotenuse is a sheet of diffusing opal glass, facing inwards and enclosing 5 ft tubes. The fitting is suspended by conduit and required pre-assembly into eight sub-units (four U-sections representing the ends of the arms and four L sections representing the inner corners of the cross) on the floor, each then being presented in turn for fixing.

Electrical Distribution System

To meet the installed load of 1·24 MW, an extensive distribution system has been installed, based on four rising mains, each of the GEC's 500 A, four-pole rising busbar system. There are two main switchboards in the basement, each separately fed from two new LEB substations on the site. One switchboard comprises merely two 500 A t.p.n. fused switches for supplying two risers: the other has, apart from two similar 500 A units, a 300 A switch feeding some 40 h.p. of pumping equipment associated with the sprinkler fire extinguishing system and a 200 A unit for the boiler room, a 100 A unit for the firemen's lift, which also feeds part of the ventilating plant, and a 30 A emergency supply. All other lifts are fed from the busbars.

The positions of the four busbars are shown in the plan, opposite, which also shows a typical floor distribution system. Main lighting for each floor is taken from a 60 A t.p.n. tap-off unit, which augments the 150 A s.p.n. tap-off originally provided and now employed for the 13 A socket-outlet system.

The distribution system on each floor is based on the GEC's underfloor 4 in. by 2 in. multi-duct trunking which interconnects each riser, and on the first floor also passes through the link area to make a complete ring. At approximately 9 ft intervals along the trunking, 10 ft lengths of four 1 in. conduits are branched out on each side of the main trunking run, terminating in an adaptable box. From these boxes, short lengths of conduit are run to socket-outlets and lighting outlet positions as required on the ceiling below. Inspection traps are provided to gain access to main trunking and boxes.

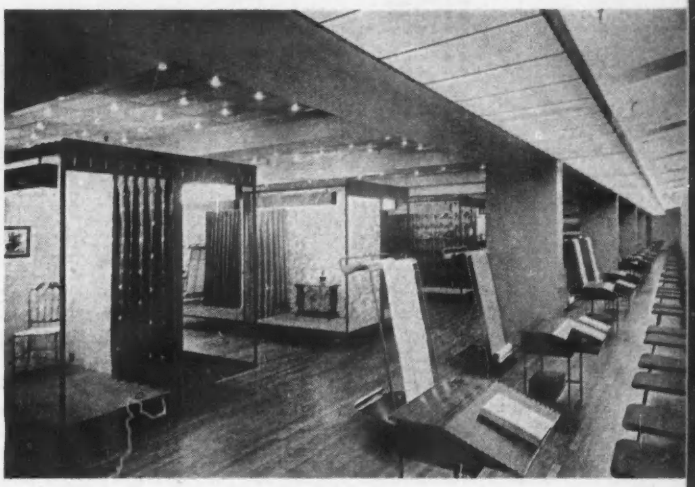
Alterations easily made

Recessed ceiling lighting points are supplied by 2 A, three-pin socket-outlets in round conduit boxes. Display units and stands are supplied from 15 A floor socket-outlets provided in special traps and requiring only new sockets if the conduit connections need to be extensively altered.

Apart from these outlets, 13 A sockets are provided elsewhere in floors and in window bays and columns where required, largely for supplying portable cleaning appliances. These are normally covered by a hinged brass plate, to the underside of which a foamed plastics pad has been fixed to seal the actual socket tubes.

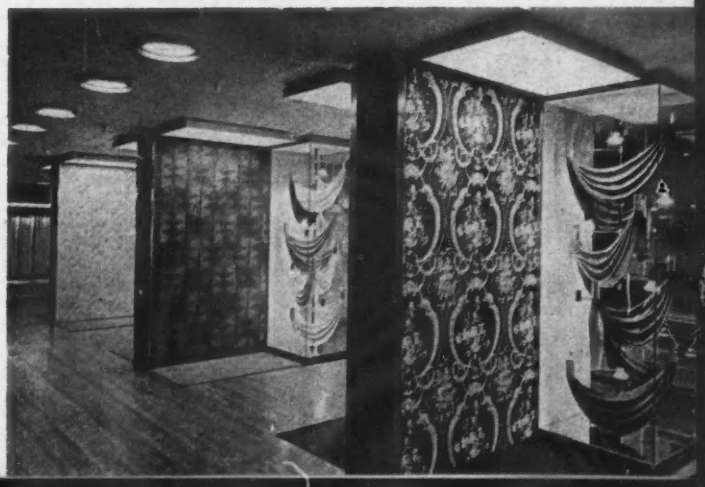
Switching of lighting and socket-outlets is carried out from grouped switch panels controlling groups of circuits by means of contactors. Electrical equipment throughout was supplied by the GEC.

The main contractors for the building were Holloway Bros (London) Ltd. and the electrical sub-contractors, Duncan Watson (Electrical Engineers) Ltd. We acknowledge with thanks the assistance of their staff, and the lighting design staff of the General Electrical Co. Ltd. for assistance in the preparation of this article.



Abundant lighting at the point of sale, ▲ and decor visualised by stylised rooms beyond

▲ Contemporary garden court with mosaic wall
Liberal lighting enhances a brilliant display of fabrics ▼



Instrumentation in industry

ONE ASPECT OF RESEARCH ASSOCIATIONS' WORK

ABOUT 200 kinds of measurement are industrially important, and detecting elements can be made for all of them. That is the estimate of the British Scientific Instrument Research Association, expressed in a special review of instrumentation and automatic control in industry, included in the annual DSIR Industrial Grants Committee publication, *Research for Industry*, for 1959. The author is Dr J. Thomson, director of BSIRA. He remarks that until recently progress towards fully automatic control was slow because a large number of detecting elements gave signals so weak that it was impossible to use them on an industrial indicator or controller. Better understanding of electronics and the emergence of semiconductor devices has changed the situation.

One important factor still limiting rate of progress is lack of knowledge about what is called the dynamics of a plant or production line; matters such as the time lag between application of a correction and system response.

Most research associations are concerned with instrumentation in one way or another and, numerically, the most important conditions that have to be measured are those in boilers and furnaces. Besides temperature, pressure and gas analysis devices, there is need for measurement of flow. Although orifice plates continue to be widely used, increased interest is being shown in electro-magnetic flowmeters (where a current flows between two probes in a liquid) and ultrasonic flowmeters (where the difference in velocity of two ultrasonic waves is detected, one of them moving upstream, the other downstream).

Development Need

Two of the most intractable conditions which have to be measured in industry are the moisture content of a substance and the humidity of environment during manufacture. Dr Thomson's judgment is that there is no generally satisfactory element for the measurement of either condition. Moisture content is generally measured by some technique depending on the electrical resistance of the material concerned. However, there is still much waste of fuel in industry through excessive drying of products, because this is the only way of ensuring they are dry enough.

Electronic Reliability

So far as indicators and recorders are concerned, Dr Thomson is outspoken in favour of electrical and electronic methods. Although hydraulic and pneumatic transmitters and indicators are still widely used, he says—and in a few cases are genuinely the better system—there is a trend towards electrical output. Yet a widespread belief exists amongst plant engineers that electronic techniques are inherently unreliable. "That this belief is wrong is indicated by the large-scale experiments on reliability which have recently been carried out by the airlines of the world." These have shown that "special quality" or "reliable" electronic valves are at least as reliable as other passive electronic components and certainly more reliable than hydraulic counterparts.

At present, recorders are in a transitional stage of design. The normal instrument operates on an analogue signal, that is, a signal proportional in some way to variation in the actual measurement. There is a tendency, however, to introduce digital systems, with the information presented in the form of typed figures.

Dr Thomson concludes his review with a defence of the scientific and industrial instrument industry against the attacks sometimes made on it.

THE annual report of the Industrial Grants Committee, which is the occasion for publication of the review of instrumentation, is concerned with co-operative research associations receiving Government grants. The committee has Sir Walter Drummond (formerly deputy chairman, NCB) as its chairman and administers grants to the associations that in 1959 aggregated £1·7 million. In 1959 as well, the number of organisations coming within the scheme reached 50 for the first time, with the recognition of the Water Research Association. Normally, the committee reviews a work of an association every five years, when its conditions of grant are revised. They are kept in touch with the work of associations in the interim years through reports of specially appointed "visitors;" for example, there are two visitors concerned with the ERA.

In their report the committee say they see cumulative evidence that British industry is taking a growing interest in research. Grant-aided research associations are part of this trend, and all types of activity—basic, applied and sponsored research development, information and advice—are benefiting from the expansion.

During 1959, grants to 12 associations were reviewed. They ranged in size from that dealing with files (a block grant of £2,000, providing industry contributes £4,000) to shipbuilding (a block grant of £60,000 contingent on industry finding £300,000).

Co-operation between DSIR research stations and one or more research associations received attention in three spheres during 1959; creep (in which ERA is much concerned), fatigue of metals and shipbuilding.

Recently the committee has been much concerned with techniques by which research associations can keep in touch with members and let them know the results of research. They say they are prepared to make special grants of up to two-thirds the estimated cost of experiments in this aspect of "communication." During 1959 there were 14 such applications, most of them concerned with lectures, conferences, training courses, discussions and films; plus the appointment of special liaison staff. Amongst the more unusual suggestions were a BISRA plan to provide an advisory service on ergonomics and human problems based on its researches into this field; and a Wool Industries Research Association scheme to buy samples of machines which it thinks will improve quality of members' products, install them in members' works on a trial basis, and sell them to the members if they come up to expectations.

AROUND THE TRADE

BY PEREGRIN

WHAT a Summer this has been! It has knocked out those sales of washing machines and refrigerators that had not already succumbed to the h.p. regulations. However, there have been one or two bright spots in this dull world: lighting fittings of all kinds have hit a new "high" and dishwashers have crept a little way out of the doldrums which is their perennial home. In the old days most homes were fitted throughout with glass shades ranging from the 10 in. conical in the kitchen to the three-chain hanging bowl, or panel fitting, in the drawing room. Today much more care and thought is given to lighting and even the small homes sport a three- or five-light fitting in the best room, and wall brackets over the beds. This type of sale is quite often the subject of wedding presents or "thank-you" gifts from summer visitors; all of which keeps the trader's till ringing throughout the slack period. Incidentally, light fittings sales during the year now account for a substantial portion of the trader's turnover—if he stocks them!

Dishwashers

The brightening of dishwasher sales may be partly due to the introduction of the Colston draining board type dishwasher, but all models have attracted a little more attention. It is a pity that such sales continue to be comparatively few and far between but, for one thing, prices remain too high. It is time this appliance came out of the luxury class of goods. Other matters which operate against them are that they are, of necessity, too bulky for many kitchens and they are not sufficiently "flexible" in use. One answer to the size problem would be to incorporate them in the kitchen sink unit, but then electrical retailers would probably have them taken completely out of their hands. With regard to their flexibility—the housewife does not want to feel that she must buy her crockery to fit the dishwasher, but the baskets are so rigid that only certain shapes and sizes of crocks can be washed. It is not the washing of plates that worries the average housewife but the odd shaped dishes, jugs and basins which always have to be washed separately—to say nothing of the saucepans. Again, dishwashers do not dry as completely as they should, and the tidy housewife does not like the injunction to leave them in till the next meal: she wants them away without recourse to a tea towel. They are not yet ready to supersede the sink, dishcloth and tea-towel—a thoroughly unhygienic method incidentally, of which point much more could be made in advertising.

And talking of advertising, I have just had an amazing example of how effective is the "tied" advertisement in the large dailies with the list of stockists in each town. No one can resist looking to see who is included in his own town, and so it proved with Flatleys' advertisement. I hear that several dealers had a complete "sell out" and had to telephone for more and that inquiries elicited the fact that the name had been taken from the newspaper attached list in every case. It is almost an idea that the ECA (should I say NECTA?) could copy to boost the "odd jobs" through the summer. What a blessing it could prove to the small contractor.

R.P.M. Inquiry

I have been interested to read details of the inquiry by the Board of Trade into resale price maintenance as it is practised at present in the United Kingdom. This inquiry, in the form of a questionnaire covered by an explanatory letter, is of importance, not only to retailers but to the general structure of negotiative salaries and wage rates. Lack of maintained retail prices would affect not only the distributive trades' workers, but also the workers in the factories which made the goods. It should be clearly stated at the beginning that you cannot have price chaos at one end of the scale and maintain wage standards at the other.

The Board of Trade are wise to seek the opinion of all those concerned with distribution and retailing and, moreover, they are not losing sight of the necessity for some service after the goods are sold—possibly at some cost to the retailer—in the present structure of distribution. This point is of particular interest to the electrical retailing trade and, of course, radio and television. And in filling in this questionnaire, one, aparently, has the opportunity of asking for a repeal of Section 25 of the Restrictive Trade Practices Act, 1956, when answering the general questions. In my opinion this Act has done many times more harm than it has done good; it appears, in fact, to have had the reverse effect of what its architects intended.

The setting of the schedule itself is illuminating—food first, then drink, tobacco and newspapers: practical items, necessities and soothing syrups are in the "also rans." But one must admire the common sense outlook of the officials concerned with the inquiry, whose object is obviously to find out how widespread is the practice of price maintenance, with the sideline of price fixing. I hope the information given will not result in another CMA or ELMA type of upset. That type of price maintenance was more of a benefit to the public pocket than otherwise.

Electrical Details

Among some 37 items dealing with electrical retailing and including radio and television, additional special information is requested on ten of them. One of these items is electric shavers—of which I should say there are enough brands on the market to ensure keen prices without any control. In addition, I hear that the daddy of all electric shavers—the Schick—is now coming through the Customs from the USA in large quantities.

Of particular interest to electrical retailers is the section which asks for details of after-sales service—installation; instruction in operation; both minor and major adjustments and repairs; periodic inspection; whether trained staff is kept; whether a comprehensive range of tools and spares is kept; whether any of this service is given free; and, also, the cost of such service as a percentage of turnover. There will surely be great differences of information given on some of these points, as many retailers seem content to hand over all service to the manufacturers. Space forbids further comment but I would like to prophesy that common sense price maintenance will prevail. Further, I would like to see sections of this questionnaire published in trade journals.

C.E.G.B. goes to supercritical

375 MW UNITS FOR DRAKELOW C USE 3,500 LB/SQ IN. STEAM

TWO 375 MW boiler-turbine-generator units operating above the critical steam pressure are being ordered by the CEGB for commissioning at Drakelow C from 1965 as part of their programme of development. This move into more advanced steam conditions has been under consideration for some time. The steam conditions chosen are 3,500 lb/sq in., 1,100°F at t.s.v., with reheat to 1,050°F, so both pressure and temperature represent an advance on what the board have specified previously.

Four manufacturers will be involved in the project, each set and boiler being made by a different firm. Those concerned are AEI, Babcock and Wilcox, English Electric and International Combustion. Because the negotiations have only reached the letter of intent stage, technical details of the proposed units are sparse; what is available is summarised below. The CEGB say that the aggregate value of the contracts will be £15 million and that the units will cost slightly more than sets of similar size operating at subcritical steam conditions. However, the better thermal efficiency obtainable (approaching 40%) should permit relative fuel savings that will offset this higher cost.

Technical Details

AEI. The single-shaft turbine-generator to be supplied by AEI will have a four-cylinder, tandem-compound turbine, solid coupled. High pressure and intermediate pressure cylinders will be single-flow and there will be two double-flow, low-pressure cylinders exhausting to twin condensers. The mono-bloc rotors will be carried on six spherically seated journal bearings and one separate thrust bearing in the intermediate pedestal.

From the t.s.v. conditions of 3,500 lb/sq in., 1,100°F, the steam will be expanded in the h.p. cylinder before admission to the boiler for reheating to 1,050°F. Pressure at the interceptor chest after reheating will be 630 lb/sq in. Eight stages of feed heating are incorporated, giving a final feed temperature to the boiler of 505°F±5°.

The turbine is to incorporate the AEI Baumann multi-exhaust system, in which a proportion of the steam leaving the penultimate blades is deflected to the exhaust casing. In consequence, it is possible to restrict the last blade length to 29½ in. on a mean diameter of 83 in. The resulting tip speed will be such that stresses are kept at a reasonable level.

Because of the high temperatures involved, austenitic materials will be used in the high temperature parts of the turbine. Condensers will employ double tube-plate construction as a precaution against contamination of the condensate.

The alternator will be hydrogen cooled with direct water cooling of the stator conductors. It will generate at 19 kV and its 375 MW rating is for 0·85 p.f.

Babcock and Wilcox. The boiler B and W are to build will be p.f.-fired and, of course, of the forced-flow, once-through type. It is rated to supply 2,500 klb/hr steam at 3,650 lb/sq in., 1,110°F, with reheating at a boiler pressure of 713 lb/sq in. to 1,055°F. Fuel consumption is reckoned to be about 150 tons/hr and large capacity ball-type mills of a new design developed by B and W will be used.

English Electric. Again, a single-shaft, four-cylinder design is proposed for this firm's turbo-generator. This will have stop valve conditions of 3,500 lb/sq in., 1,100°F, with steam returning to the intermediate-pressure cylinder at 1,050°F. Vacuum at maximum and continuous rating is 28·7 in. Hg.

The h.p. cylinder will use a double-casing arrangement over the first stages to meet operating requirements. The expanded steam will pass over the outside of the inner casing on its passage to the remaining stages. Ferritic materials are to be used for the casings, use of austenitic materials being avoided. Castings are to be used for the casings and stress levels kept so that creep deformation remains within acceptable limits.

The i.p. cylinder will have a partial double-casing construction similar to the h.p. cylinder. The quadruple-flow l.p. section of the set is to be arranged in two double-flow casings, each exhausting to one of the two condensers. A 36 in. effective length last blade design is to be used, based on a mean diameter of 100 in. This last blade design is similar to that being used for the 275 and 350 MW sets for Blyth B and Drakelow C stations, respectively.

Each shaft will be carried on two main bearings, with solid couplings between rotors.

The alternator will be hydrogen cooled at 45 lb/sq in. gauge, with water-cooled stator conductors. The 375 MW rating is based on 0·85 p.f.

Eight stages of feed heating are planned. The l.p. heaters will be on the suction side of the booster feed pump, and the h.p. heaters interposed between the booster feed pumps and the main boiler feed pump. Condensers will be of the twin-shell type, using double plate design to prevent contamination of the condensate by the cooling water. With this arrangement, the space between the tube plates is sealed by the condensate under pressure.

International Combustion. This firm's once-through boiler has been designed in the UK in collaboration with Sulzer Bros., Switzerland, and Combustion Engineering, USA. It will operate at 3,650 lb/sq in., 1,110°F, to supply 2,500 klb/hr steam, with reheating to 1,055°F. Tangential firing is used for the furnace and the boiler will operate under fully automatic control.

Supercritical

The advance to supercritical steam conditions is in the direct line which the supply industry has been following for many years, of seeking better thermal efficiencies through use of higher temperatures and pressures. The special feature of the new step is best appreciated by tracing constant pressure heating. If water is at a pressure below 3,206·2 lb/sq in. absolute, and is heated steadily,

it reaches its boiling point, and then continued heating has the effect of changing the water to steam at constant temperature, the heat absorbed being the latent heat. When all the water has been evaporated, further heating "superheats" the steam. But as pressure increases the quantity of latent heat in saturated steam decreases, until at the critical pressure there is no latent heat; or, to put it another way, there is no sharp difference between steam and water.

This situation is shown on the temperature-entropy diagram, which is used for steam calculations (in this diagram, areas under a curve represent heat content referred to a given temperature). When the saturated steam conditions and saturated water conditions are plotted, the arched line shown results. When the pressure is at the critical value, then there is just no boiling period at which there is a clear distinction between water and steam. The temperature at this point is a little over 705°F. At higher pressures, heating-up "water" causes a smooth passage from water to superheated steam, with no wet steam stage.

Boiler Design

A change of this nature has several implications for boiler design. First of all, because there is no sharp difference between the density of the "water" and that of the steam (it is usual to speak of water below the critical temperature of 705°F, and of steam above it), natural circulation as relied on at lower pressures is impossible. The water-steam has to be forced through the boiler.

A second point is that since there is no boiling, there is no occasion for a steam drum in which water and steam can be separated, and the water returned for further heating, and no need for separate superheaters beyond this. A once-through arrangement becomes necessary, in which the water-steam passes through the boiler only once in a number of parallel tubes typically of relatively small diameter. (However, for convenience the terms economiser, boiler and superheater are likely to be retained for various sections of the steam-raising unit.)

Turbine Factors

With no separation of steam and water phases, the problem of solids dissolved in the water becomes of increased importance; and there is an increased risk of solids being carried to the turbine. This clearly increases the importance of water treatment when supercritical pressures are used.

Considerations of wetness at the exhaust end and other related factors argue the convenience of increasing temperature as well as pressure in the search for higher thermal efficiency. In fact, to go to supercritical pressure without a high enough temperature may not pay off in efficiency terms.

Supercritical pressure steam is so dense that turbine blade heights at the h.p. end are small; hence, on the one hand, large-output machines are possible, and on the other, small machines are unlikely to be practical propositions because of the heavy interstage leakages. At 1,100°F, 3,500 lb/sq in., the specific volume of steam is about 0·23 cu ft/lb; this compares with 0·76 cu ft/lb for the 900°F, 900 lb/sq in. conditions that are standard for 60 MW sets. This factor is given added importance since less steam (in terms of weight) is needed to perform a given amount of work at higher temperature and pressure than at lower levels.

In the USA, a number of supercritical sets are building. Several of them use pressures of 3,500 lb/sq in., but there is one of 4,500 lb/sq in., and one of 5,000 lb/sq in. After initial trials at 1,200°F, the tendency there was to drop back to 1,050°F. Most of the US sets incorporate double reheat, and sets are in several cases cross-compound. The largest rating is 450 MW, cross-compound; the largest tandem-compound machine is 250 MW rating. A feature of the US designs is the tendency to reheat the steam twice, each time to about the original temperature.

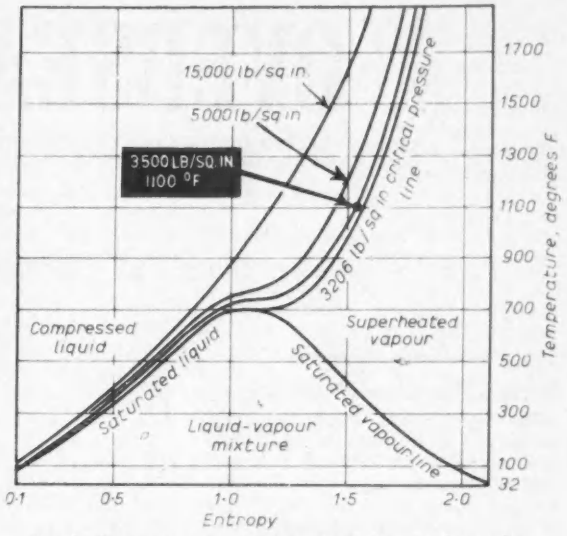


Fig. 1. Temperature-entropy diagram showing conditions for cycle proposed for Drakelow C 378 MW sets

Post-war Progress

The announcement of the CEGB's intention to proceed to a supercritical cycle provides a suitable occasion for glancing at the progress made since the 30 MW and 60 MW sets which were standard soon after nationalisation.

The 60 MW sets operated, of course, at 900 lb/sq in., 900°F, the 30 MW at 600 lb/sq in., 850°F. Such sets and accompanying boilers were ordered in quantity when the urgent need was to catch up the backlog of plant commissioning and in that way fight clear of the load shedding situation so unpalatable to the industry.

A limited number of 60 MW sets were designed to operate at 1,500 lb/sq in., 1,050°F as a development project. These were followed by 100 MW sets, some designed for the 1,500 lb/sq in., 1,050°F conditions, others for 1,500 lb/sq in., but incorporating reheat to 950°F, following an initial temperature of 975°F. Combination of the reheat principle with the proved high temperature possibilities led to the standardisation of a 120 MW set, incorporating reheat to 1,000°F after initial steam conditions of 1,500 lb/sq in., 1,000°F.

The next step towards large sets came in 1954, when the first of the 200 MW sets was authorised. The increase in capacity, which was associated with the idea of coalfield based generation and bulk transmission to load centres was considered to justify a further pressure advance to 2,350 lb/sq in., and a return to the initial temperature of 1,050°F used in the straight 100 MW sets, with reheat to 1,000°F.

After this, there has been a rapid advance in experiment. On the basis of 2,300 lb/sq in., 1,050°F initial temperature, 275 MW and 550 MW sets have been ordered, while 2,400 lb/sq in., 1,055°F has been selected for a 350 MW set.

All these advances have brought better thermal efficiences. For the 200 MW sets, 35·5% efficiency has been quoted, for the 275 MW sets, 36%, and for the 550 MW sets, 36·5%. It is hoped that supercritical pressures may bring a jump to the 40% mark.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Quebec, Shawinigan Profits Up . . .

The report of the Quebec Power Co. for the first six months of this year show an increase in net earnings of 5% to $816,737 over the same period in 1959. Revenue from power sales rose 6·3% to $8,180,584 while total operating expenses were also higher by 6·8% at $7,508,543.

Increase in consolidated net profits are also recorded for the first six months of the year by the Shawinigan Water and Power Co. The profits, which include those of the St. Maurice Power Corp. and Southern Canada Power Co., were up 13·6% to $7,159,131. Revenue sales from electricity increased 7·9% to $40,577,850, but operating expenses also rose by 8·6% to $31,809,145. This rise in operating expenses is attributed to more power purchases from other authorities and an increase both in depreciation write-off and in taxes.

. . . British Columbia Down

For the first time in its 15-year history the British Columbia Power Commission recorded a net loss of $218,930 for the year ended 31 March, 1960. This deficit is attributed principally to increased charges on new capital assets constructed over the past two years. In spite of the deficit, revenue for the year increased by 11·4% to $19·1 million with a revenue per kWh equal to 2·43c, which is unchanged from last year.

At the end of the fiscal year, the commission was supplying 84,304 customers' an increase of 5% on last year, with energy supplies also up by 7%.

During the year, development schemes were completed at Strathcona and Ash River and the Georgia gas turbine station on Vancouver Island was finished. Two generating units were added to the Prince George gas diesel station, increasing the total capacity to 18 MW. Four small diesel stations were brought into service during the year, two units at Dawson Creek and one each at Quesnel and Albert Bay. Two small diesel stations at Vanderhoof and Fort St. James were taken out of service with the completion of a transmission line, and a transformer station was built at Crofton. Further information on possible hydro-electric developments in the Clearwater River area is given in the report. It will be recalled that the first development site under study was selected at Pyramid Mountain. A second possible site at Flourmill Creek has been the subject of a preliminary survey. Study has also been made of system connections in the southern central interior as well as of new power sources. Work continues on the Ucona, Kokish and Homathko River schemes.

Losses recorded by the commission have not sufficiently deterred investors to counter a prediction that the commissions 5% parity development bond issue, of $25 million, will be over-subscribed.

As a result of the rural electrification assistance programme inaugurated at the beginning of this year, a further 44 applications for service in rural areas served by BC Hydro are expected to be connected within the next few months. Extensions are estimated to cost $750,000 and will be partially met by the Government's offer to pay annual operating losses up to a maximum of $200,000 for service extension to fringe areas where cost of providing service exceeds $800 per customer.

Engineering Companies Merge

A merger between the Federal Pacific Electric of Canada, Toronto, and Pioneer Electric, Winnipeg, has been announced.

Pioneer Electric consists of five companies manufacturing a range of transformers, switchgear and control apparatus. Mr B. W. Ball, president of Federal Pacific, whose company manufacture distribution equipment and fluorescent lighting products, said the two companies would be complementary when merged. The integration would provide a complete series of electrical power distribution and control products.

Germany Favours CANDU

Favourable comments on the Canadian nuclear reactor programme are reported to have been made by Dr Balke, West Germany's Minister for Atomic Affairs, during his recent visit to Canada. He considered the Canadian reactor design as being the only one in the world based on a reasonable commercial calculation.

Dr Balke said West Germany was not interested in the enriched-uranium reactor because it meant being tied to a single source of fuel, but rather favoured a reactor fuel fed by natural uranium with a heavy-water moderator. Utilities in Western Germany want assurance that nuclear power is economical before they invest money in development. Such reassurance could be given by the CANDU reactor scheduled for completion in 1964 or 1966 at Douglas Point.

Reactor Agreement

It is also recently reported that an agreement for research on smaller nuclear reactors between Canada and Australia may soon be expected. Both countries are interested in opening up mineral deposits in remote districts.

However, a recent report published by Canadian Westinghouse suggests that it will be some time before nuclear power plants are competitive with diesel generation. The report, commissioned by Atomic Energy of Canada Ltd., examined a project for heating and power need at Frobisher Bay in Baffin Island. The report gives cost figures for nuclear power plant ranging from 2 to 40 MW and suggests that for a 20 MW set capital costs would be 1½ that of a comparable diesel plant, with 25% higher running costs.

CYPRUS

Electricity Authority Appointed

Recently announced is the constitution of the new Electricity Authority appointed in Cyprus. The Authority will consist of seven members, five of whom are Greek Cypriots and two members Turkish Cypriots. The Authority will be constituted under Mr G. A. Gabrielides as chairman and Mr Ali Dana, deputy chairman. Mr Gabrielides is well known in Cyprus as an engineer and Mr Dana is a lawyer.

The appointment of the new Electricity Authority follows the termination of the engagement of Mr H. F. Carpenter, C.B.E., who for several years past has been chairman of the Electricity Authority of Cyprus.

JAMAICA

Consumers Pay for Conversion

Cost of the electricity frequency standardisation scheme now under way in Jamaica will be met by a surcharge on consumers. Announcing this the Hon Wills O. Isaacs, Minister of Trade and Industry, said that 5% surcharges would be levied in the Port Antonio and Savanna-la-Mar areas, while a surcharge of 8% will be made in other areas of the island serviced by the Jamaica Public Service Company's interconnected system. The Port Antonio conversion, completed last year, cost £7,300. The scheme for Savanna-la-Mar scheduled for completion in July is anticipated to cost £8,000

and the schemes in other areas amount to £2,110.000 without including interest charges on loans.

Estimates indicate that on the basis of a 5% surcharge, cost of conversion in the Port Antonio scheme will be recovered in seven years and for Savanna-la-Mar within six years. The 8% surcharge on the Jamaica Public Service Company's island-wide interconnected system will, it is estimated, enable the cost of conversion to be recovered within a period of nine years from 1 Jan., 1961. This estimate, however, is based on present costs and forecasts of the company's revenue during the period.

Unanimous approval was given by the Legislative Council to the electricity law enabling the frequency conversion to take place at a session held recently.

Plant Extensions Contract

A generating plant contract for extensions to Hunt's Bay power station, Kingston, has been placed with AEI Export Ltd. by the Jamaica Public Service Co. The contract is worth over a £¼m sterling and includes the supply of a 20 MW turbo-alternator set with condensing and feed-heating equipment. The plant will operate with steam conditions of 650 lb/sq in. 875°F and will generate at 13·8 kV. The turbo-alternator equipment is scheduled for commission during the first half of 1962. Engineering and constructional extension to the power station are being carried out by Stone and Webster Eng. Ltd., London.

PAKISTAN

Railway Plans

Answering questions on possible railway electrification in Pakistan, Mr F. M. Khan, the Communication Minister, has said that electrification would only be needed where there was very dense traffic, but there were many such routes.

He considered that the possibilities of fully utilising the diesel potentialities had not been exploited to the maximum. He described the investigations currently being carried out by foreign teams as "private efforts." He said the Government had not initiated them. They had merely granted permission to certain foreign firms to survey the possibilities of electrifying the railways in the country at their request. Japanese, German and recently British teams have conducted these surveys.

Revised Beas Scheme

The Irrigation Department of the Punjab Government has recommended to the Cabinet that the third Plan expenditure on the Beas project should be set at a little under Rs 54 crores, out of which Rs 40·40 crores would be spent on the Pong Dam and Rs 13·50 crores on the Beas-Sutlej link. The total cost of the two units of the Beas project is estimated at Rs 167 crores which includes Rs 87 crores for the Pong Dam in which Rajasthan is a major partner and Rs 80 crores for the link scheme. Expenditure on the two units will proceed concurrently throughout the third Plan period. The major item of expenditure on the link scheme which will be carried forward to the fourth Plan will be the construction of the power house at Dahar. The third Plan allocation will be spent, among other things, on the construction of civil works, the dam at Pandoh and the tunnel which will link the Beas and the Sutlej rivers in the Suketi area. As reported earlier, the proposal to build a dam at Suketi, which would have considerably added to the power potential of the Beas scheme, has been abandoned in favour of the tunnel in the interests of early utilisation of the full water potential of the Beas. It has been estimated that a dam at Pong coupled with a dam at Suketi would have produced 704,000 kW—90,000 kW at Pong, 570,000 kW at Dahar in the Suketi Valley and 44,000 kW at Bhakra—by adding to the firm power potential of the Bhakra reservoir. The revised scheme is expected to produce 340,000 kW of firm power—160,000 kW at Dahar, 122,000 kW at Pong and 58,000 kW at Bhakra. But under the tunnel scheme, as it stands now, it will also be possible to generate 200,000 kW of secondary power at Dahar for eight months in the year by making the tunnel large enough to take in not only the January flow of the Beas, when the river is at the lowest, but also the much larger flow during the monsoon. Thus by the abandonment of the proposal to build a dam at Suketi, Punjab will lose 364,000 kW during the four months of winter, but only 164,000 during the eight months of summer flow in the Beas.

Development Plans

Plans for increasing the capacity of the Karachi Electricity Supply Corporation's plant to 15 MW by 1965 were announced recently. New power schemes to be developed over the next five years are expected to cost Rs 190 million.

Cable Factory Proposals

Approval for the establishment of a telephone cable factory in Pakistan is reported to have been given by the Government. At present cables worth Rs 6-7 million are imported from other countries, and it is estimated that the new factory will save Rs 2·7 million in foreign exchange each year.

It is also intended that the factory will help in training department staff in the special problems of cable manufacture and maintenance.

UGANDA

Scheme Completion

Completion of the first stage of the comprehensive scheme to bring electricity to the Kaberamaido, Otuboi and Orungo areas of the Tesco district is announced by the Uganda Electricity Board. In the 13 months from the start of the survey operations, 34 miles of 33 kV overhead power line from Soroti to Orungo Village have been constructed. A feature of this development has been the large part taken in both survey and construction by African staff of the board. Work on extension of 11 kV lines from the 33 kV system is now proceeding. This will bring electricity supplies to Kalaki, Lwala, Otuboi and Kabulubulu, besides Kaberamaido itself.

Generation Increase

Maintaining the increase in units generated last year, during the month of July electricity generated in Uganda increased by 10·5% to 20,247,876 units. A further 13,669,000 units were exported to Kenya during the month. Total generation for the first seven months of the year has now risen by 15·2% over the same period last year to 225,580,431 units. For Uganda alone, the increase was 10·9%.

BRITISH GUIANA

Loans for Electrification Scheme

Negotiation of a loan for a British Guiana electrification scheme was the object of a recent visit to London by Dr Jagan, British Guiana Minister of Trade and Industry.

He said the proposed scheme would cost over £8m, but his immediate aim was to raise £2m so that work could start as soon as possible.

RHODESIA

Loan for Salisbury

The Federal Power Board is to make a loan of £200.000 to the Salisbury Municipality for installation of equipment. The loan was announced in the Federal Assembly on 25 July by the Minister of Power, Sir Malcolm Barrow, who said the money would be used by the Salisbury Municipality to install equipment enabling more power to be drawn from the Kariba hydro-electric scheme. It is expected that the loan will enable the Federal Power Board to save £100.000 per year by using power from Kariba rather than by generation at the Salisbury thermal stations.

SWEDEN

Large Transformer

What is claimed to be the world's largest transformer of its kind has recently been ordered by the Swedish State Power Board from the Asea Co., Västeras. The three-phase unit is to have a rating of 350,000 kVA in the initial stage of operation, later to be increased to 375.000 kVA. Usually it is the transport facilities which limit the size of a transformer. In the case of the unit just ordered, the Swedish State Railways have placed an order for a truck which will have a load capacity of 260 tons. When assembled, the transformer will weigh about 300 tons.

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by J. Mellanby, M.A., A.M.I.E.E., M.Inst.F.

WHILE the self-contained, motorised production machine is now commonplace in almost every branch of industry and has generally reached a high standard of perfection, experience in the electrical servicing of such equipment shows that there is still room for improvement in details, more especially when these may involve collaboration between the machine maker and other parties responsible for the motor and the control gear. Many special designs of motor are now available and practically every requirement of the machine maker in speed, torque, shaft extension and mounting can be met but, as any maintenance man knows, terminal boxes and means of connecting the cables too often leave much to be desired—in fact, there appears to be a "factor of inconvenience" inversely proportional to the size of the machine. This is practically axiomatic. On a big motor, connected by 0·1 in. cables or so, unless quite large clearances are allowed it just could not be connected at all. On the other hand, there appears to be no limit to what nimble-fingered girls can do with flex in restricted spaces on fractionals. Unfortunately, it is usually impossible to send for the girl to re-do her work in an awkwardly placed corner of, for example, a bakery.

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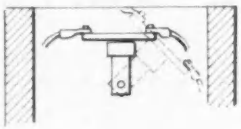
Terminals

Every known type of terminal can be found on motors, starters and push buttons, including hole and pinching screw(s), clamping, various special types of washers, patented and otherwise, and, the most annoying of all, the permanently-soldered joint which can only be disconnected with a soldering iron or by cutting it off. There is no doubt that the new crimping kits, comprising a compression tool and a selection of lugs to suit various sizes of cable with holes for the usual range of bolt sizes, are one of the greatest boons to the service man to be found among recent developments. Small strands may be dealt with where they can be *seen* instead of being put into position by feel at the bottom of some dark recess. Moreover, if the system is used during manufacture, connections may be removed for testing without damaging the conductor ends. Since the efficiency of this type of joint has been proved beyond any reasonable doubt, it seems strange that conservative manufacturers still adhere to the more costly and inconvenient method of soldering.

Flush or Inset Starters

Flush starters, by avoiding projections, can save valuable factory space and add greatly to the appearance of a machine when the manufacturer is able to provide a suitable recess. It is a pity that there does not yet appear to be a set of standards for the dimensions of the face-plates, etc. A lot of inconvenience can be caused when it is necessary to replace a complete starter and one of the original make is not available, a too common state of affairs in many overseas territories. Again, many factory owners like to standardise on one make of control gear throughout their plant for ease of maintenance but physical dimensions, rather than electrical characteristics, often render this impossible. However, a further difficulty, and quite a fundamental one, cropped up in connection with a bread-slicing machine. Here both motor and starter were housed within the casting forming the base, which attained a temperature of about 110°F after an hour's running with an outside (tropical) temperature of 85°F. The overloads on the starter were set for an ambient temperature of 60°F in the maker's works and adjustment for the new conditions entailed careful bending of the bi-metallic strips, euphemistically called "lining up" in the instruction sheet (and so translated into five other European languages). How to carry out this adjustment in the enclosed space proved to be an insoluble puzzle and it must be admitted that the strips were finally set by guesswork. The provision by the manufacturers of some calibrated means of temperature adjustment would add to the complexities and cost of the gear to control a very small motor. An operational disadvantage of the arrangement is that during the warming up period the overload protection is almost completely inoperative. This would appear to be a good example of the kind of instance where more collaboration between the parties concerned would be advantageous for all, not least those responsible for maintenance.



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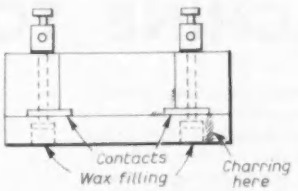

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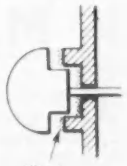

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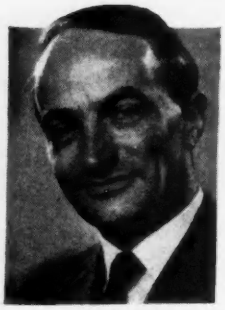

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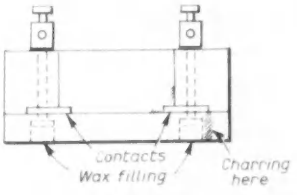

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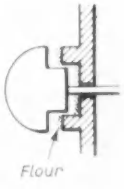

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Dust

When both motor and starter are contained within, for example, the casting supporting the headstock of a lathe, and they are both fitted with well-fitting covers, it is unlikely that foreign matter such as chips and turn-

ings will enter to cause trouble. Woodworking machines, however, may easily get filled up with sawdust and the quantity of crumbs which found its way into the bread-slicer already mentioned was astonishing. In such circumstances a separate enclosure must be provided for the starter mechanism and this may either be incorporated as part of the machine itself or else provided along with the starter interior. It is surprising, however, how often manufacturers provide totally-enclosed motors, with gaskets on their terminal covers and starters of similar construction, and then lead the cables through bushed holes. Where, for example, a small p.v.c.-covered cable passes through a $\frac{3}{8}$ in. bush, there is still sufficient space for an ounce or two of bread crumbs to pass within a space of months, to the detriment of the mechanism. The provision of suitable glands in such positions is strongly recommended.

A further fault, which occurred on a dough brake, might easily have had serious consequences. For those who are not familiar with bakery equipment, this is a machine like a mangle and, if anything other than dough should get between the rollers, instantaneous stopping is obviously called for. It was, therefore, extremely disconcerting for the operator to press the "Stop" button on the built-in starter and to find that nothing happened. In fact, the only way to stop the machine was to use the isolator on an adjacent wall. As Fig. 3 shows, the cause of the trouble was an accumulation of flour, which limited the travel of the button. Since this is a machine which inevitably gets covered with flour in use, and this gets into even the smallest crack, it would seem that the manufacturers were at fault in fitting a starter of this design in the first place.

Suggested Remedies

While it is to be hoped that some of the practical points mentioned above may ultimately percolate through to the designers of machines, this desirable end would appear to be unlikely under the conditions of growing specialisation in the industry. Designers sit in drawing offices and do not go out on installation or service work. Service men are quite used to finding terminal boxes full of sawdust, flour or other substances but they appear to treat these events as a normal part of life and, after expressing a few unprintable words, clean out enough of the unwanted material to enable the plant to work before proceeding to the next job. If, however, these service men could be persuaded to complain in an articulate manner, their bosses would pass these complaints on to the right quarters and it would only need the designers to be in a receptive frame of mind for things to happen. Like most other modern problems, it is a matter of education. As a first step, service men should learn to complain and ultimately the control gear which they have to attend to will not be installed in places requiring them to be contortionists to service it.

MACHINE TOOL DRIVES

ONE of the most significant changes in the industrial workshop over the past half-century has been the almost virtual disappearance of the shaft-cum-belt drive with a number of machines driven from a single motor. Machine tool makers have found that the scope of their products could be extended considerably if they made a careful study of the types of motor and control available rather than just by specifying an electric motor of a particular horsepower and speed. Electric motor manufacturers, on their part, have recognised the special requirements of the machine tool industry and co-operated both in the provision of technical advice and in the production of specialised motors and control gear.

That collaboration is particularly active today and is responsible for such recent developments as the co-ordinate electronic control and diffraction grating techniques demonstrated at the recent Machine Tool Exhibition.

Small Machine Drives

Taking, first of all, small machines requiring up to 50 h.p. and with the driving shaft running at a single speed in either or both directions, the three-phase squirrel-cage motor is the obvious choice (assuming, of course, that the location is one with an a.c. supply system), but both the type of motor and the form of starting will depend upon the duty cycle of the machine to be driven. For light-load starting where the somewhat high starting current peaks are not objectional, the single squirrel-cage motor with direct-on starting is adequate. A four-pole machine (nominal speed about 1,480 r.p.m.) takes up to $5\frac{1}{2}$ times full-load current at starting with an initial torque of up to 1·8 times full-load torque and a stalling torque, at full speed, of just over $2\frac{1}{2}$ times rated full-load torque. Six- and eight-pole (985 r.p.m. and 740 r.p.m.) motors take up to $4\frac{1}{4}$ times full-load current at starting with slight reduction in starting and maximum torques. Where these currents are too high for local conditions or the motor is in the upper h.p. range, star-delta can be substituted for direct-on starting.

Increase of initial torque up to about $2\frac{1}{2}$ times f.l. torque can be attained by the use of double-cage s.c. motors, but this is achieved at some loss in peak and accelerating torques. Starting can also be direct-on or star-delta.

Another form of s.c. motor is the low current, high reactance type in which the squirrel-cage bars are set back from the periphery of the rotor. This results in some reduction of starting current, also at the expense of initial and accelerating torques, but enables the larger h.p. machines to be used with direct-on switching where otherwise star-delta or auto-transformers would be required.

All s.c. motors are, of course, reversible by the simple expedient of changing over connections to two of the three phases, but if frequent rapid reversal is a requirement of the machine tool, this should be specified to the maker as the rotor has to be designed for the purpose. The watts loss at reversal is about four times that of a normal start and the heat has to be dissipated somehow. The use of a high-resistance rotor helps in that it reduces the current and, therefore, the heating in the cage bars. The question of inertia also comes into the picture where frequent and rapid reversal is called for.

Large Machine Drives

For the larger machines slip-ring motors may be preferable or the use of higher voltage supplies with squirrel-cage motors. Both types are available up to 1,000 h.p. (1,000 r.p.m.) on 6·6 kV supplies. These, of course, require special switchgear and starting arrangements.

Variable Speed Drives

For variable speed drives the a.c. repulsion motor, usually of the Schrage type, has some applications, but the d.c. motor is the most versatile. If no d.c. supply is available, then recourse to a motor generator with Ward-Leonard or thyratron control is the alternative. This naturally involves a special design which will have to be taken up with the motor manufacturers at an early stage and accommodation for the m.g. set, as well as the motor and control gear, will have to be arranged.

High Speed Drives

The highest speed attainable with a.c. motors on the 50 c/s system is about 2.850 r.p.m., but, by the use of frequency changers and special motors, shaft speeds of up to 100.000 r.p.m. are possible. The highest speeds are usually confined to small grinding spindles not exceeding $\frac{1}{2}$ h.p.

All motors must be in accordance with the requirements of BS 2613:1957 with the class of insulation to meet the conditions of service. There are four classes with temperature limits of 55°C (A), 65°C (E), 75°C (B) and 115°C (H).

This article is largely based on *Machine Tool Drives*, a book covering various applications of electric motors and control to machine tools, published by the Motor and Control Gear Division of AEI Ltd.

Protecting A.C. Motor Circuits

by J. L. Watts, A.M.I.E.E.

PART 3. OVERLOAD PROTECTION

MECHANICAL overload when running is a common cause of overheating of a motor, due to the increased I^2R losses. An overload may be momentary, i.e., of such short duration that it has negligible heating effect and is not dangerous; it may be sustained so that it has a considerable heating effect; or the motor may become seriously overheated through a succession of peak loads, as may occur in certain duty cycles.

Overload Elements

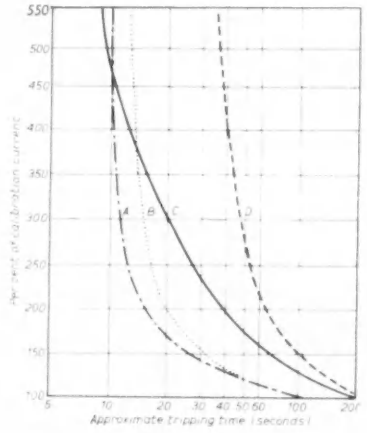
Protection against mechanical overload thus requires the use of a device which will not switch off the motor in the event of momentary overload but will cut off the current in case of a sustained overload or a succession of overloads liable to create dangerous heating. Protection against sustained overload may be provided by magnetic overloads with time lags or by thermal overload releases, which disconnect the motor in case of sustained overload in excess of the safe loading. The trip may function by mechanically moving a hold-on catch; more frequently it operates contacts in series with the under-voltage release coil of the starter. For overload protection one overload element is normally provided in any conductor (other than an earthed or neutral conductor) of a single-phase motor circuit; two elements, one in each phase of a two-phase motor circuit; and two elements, one in each of any two phases of a three-phase motor circuit. Theoretically, one overload release should protect against purely mechanical overload but the extra releases in a polyphase motor circuit provide some protection against overheating due to unbalanced supply voltage or open circuit.

Motor Life and Temperature

If a motor is allowed to overheat, the life of its insulation will be reduced. It is estimated that the life expectancy of Class A insulation may be roughly halved for 10°C increase of the "hot-spot" temperature or 12°C increase of temperature for Class B insulation. Column 2 of Table 1 (p. 245) gives maximum safe operating temperatures, for various classes of insulation, for a reasonable length of life. Column 3 gives the maximum permissible temperature-rise (above ambient temperature) of the external surfaces of windings and iron cores in contact with the windings, when measured by thermometer, for reasonable life expectancy. If the ambient temperature exceeds 40°C, the permissible temperature-rise should be correspondingly reduced. The temperature of the accessible surfaces may be measured by thermometers laid on the external surfaces of the windings or iron cores, with the motor at rest, the thermometer bulb being covered by a felt pad except at the point of contact.

Overload Capacity

If a motor is to be utilised fully without risk, the inverse time-current characteristic of the overload device should be related to the overload capacity (if any) of the motor. However, this can only be realised approximately. A continuously rated fractional horse-power motor having Class A insulation, which has been built to BS 170:1939, other than a motor coupled to a propeller fan and/or centrifugal load, should be capable of 25% excess torque for five minutes. However, a four-pole single-phase induction, repulsion-start, or capacitor-start motor for driving a refrigerator condenser unit should be capable of 40% overload torque for 30 minutes in an ambient temperature of 40°C. Other f.h.p. motors having Class A insulation should not be subjected to sustained overload.



A Directly heated (transformer-operated) max. calibration.
B Directly heated (transformer-operated) min. calibration.
C Indirectly heated, all calibrations.
D Indirectly heated (transformer-operated) min. calibration.

Fig. 1. Time/current graph for one make of bi-metal overload release

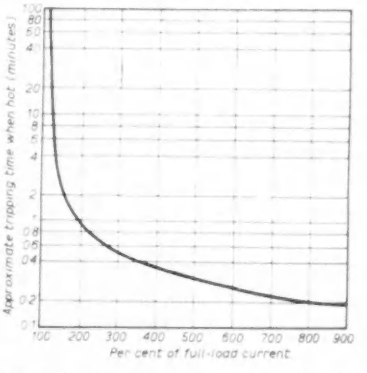


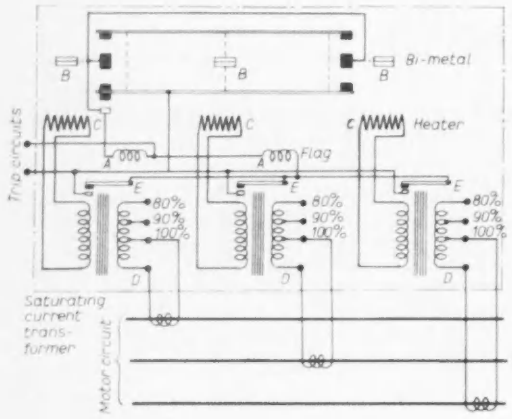
Fig. 2. Time/current graph for a typical fusible alloy type of thermal overload release

Continuously rated motors (other than totally enclosed machines) having a continuous rating permitting overload (c.r.p.o.) built to BS 168, operating in an ambient temperature not exceeding 35°C, should be capable of 25% overload torque for two hours in sizes of 10 h.p. and upwards per 1,000 r.p.m., for half-hour in sizes below 10 h.p. and down to 4 h.p. per 1,000 r.p.m. or for a quarter-hour in sizes below 4 h.p. and down to 1 h.p. per 1,000 r.p.m. The higher-speed motors generally have a lower overload capacity than slow-speed motors of the same h.p., due to the smaller amount of metal used in their construction, and also their lower heat capacity. Thus, a 15 h.p. 3,000 r.p.m. c.r.p.o. motor, having an output of 5 h.p. per 1,000 r.p.m. should not be expected to stand 25% overload for more than half-hour. Totally enclosed and short-time rated motors to BS 168 should not be subjected to any sustained overload.

Motors having a specific continuous maximum rating (c.m.r.) to BS 2613 are not intended to be subjected to any sustained overload. Whereas the 55°C temperature-rise on full load for Class A insulation, on which a c.m.r. motor is based, allows 10°C "hot-spot" allowance, the 40°C rise on full load for Class A insulation, on which a c.r.p.o. motor is based, allows 10°C for overload plus 15°C "hot spot" allowance. It is impossible to measure the maximum "hot-spot" temperature in the interior of the windings. Thus, on full rated load the c.m.r. motor may reach 15°C higher temperature than the c.r.p.o. motor. Assuming the two motors are loaded to their rated horse power, the c.r.p.o. motor may last at least twice as long as the c.m.r. motor.

When selecting a motor, particularly a c.m.r. machine, care should be taken to obtain one which is large enough to carry any overload which might arise in the normal duty cycle and it may also be necessary to consider possible adverse conditions. Since the full-load torque of a c.m.r. motor is generally based on a higher percentage of its peak torque than is a c.r.p.o. motor, a drive which is subject to momentary peak loads may

Part 1 of this article appeared in *Industrial Electricity* on 19 May, p. 807, and Part 2 on 16 June, p. 970.



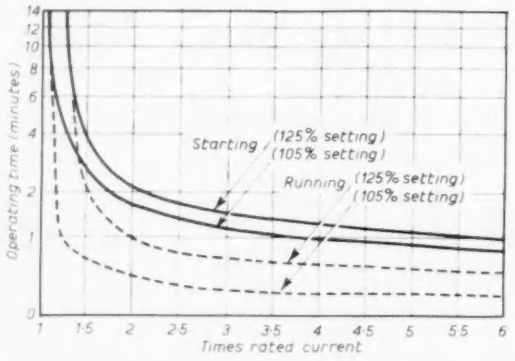


Fig. 3. (Left) Internal connections of one type of motor protection relay

Fig. 4. (Right) Time/current graph for one type of bi-metal actuated overload relay

require a c.m.r. motor of greater horsepower than would be needed with a c.r.p.o. motor. Whilst a normal c.m.r. induction motor of 50 to 500 h.p. to BS 2613 should be capable of 175% of full-load torque (for 15 seconds), a normal c.r.p.o. induction motor to BS 168 should be capable of 200% of full-load torque for 15 seconds.

Magnetic and Thermal Overload Releases

In general, the input current to an induction motor operating in the region of full load may be taken as proportional to the load torque. Thus, magnetic overload releases with time lags, or thermal overload releases, which operate in the event of a sustained current about 25% above the full-load current, may afford quite satisfactory protection against running overload on many c.r.p.o. motors. However, overload settings of no more than about 10% overload may be needed for c.m.r. motors. This may present difficulties if the same overload releases are used for protection during starting.

Fig. 1 shows the time-current characteristics of one make of bi-metal overload release. It will be noted that the directly heated releases have a shorter time lag in the region of the calibrated current value than have the indirectly heated releases of greater heat capacity.

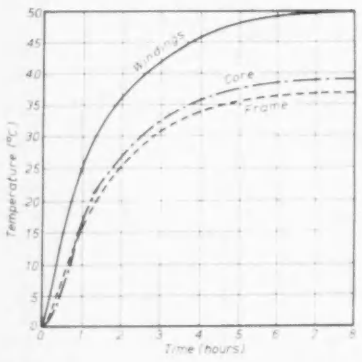


Fig. 5. Temperature-rise time graph for a small totally-enclosed induction motor

Fig. 2 shows the comparatively long time lag of a fusible-alloy type of thermal overload release on low overload currents, which render it less suitable for protecting a c.m.r. motor.

C.M.R. motors have been introduced with the intention of operating motors closer to their maximum rating than formerly, which saves material. However, this calls for closer protection if there is a possibility of a motor being overloaded or taking increased current due to any other cause. It should be noted that BS 587 requires that overload devices shall operate at the current setting, subject to a tolerance of ±10%. Appreciably lower tolerances are desirable for c.m.r. motor protection. The time-current curves of thermal overload releases during starting may differ appreciably from those during running, which may be a point in favour of magnetic overload releases for valuable motors unless separate protection is provided for starting conditions. For close protection it is generally desirable that thermal overload releases should be automatically compensated for varying ambient temperature and that all overload releases should have a fairly open scale calibrated in amps.

Motor Protection Relay

Fig. 3 shows the connections of a motor protection relay designed to protect a running motor against damage due to overload, single-phasing or short-circuit. The saturating-core current transformers D feed the heaters C, protect the heaters and prevent the relay tripping during a long starting period against a high-inertia load. The attracted armatures E operate contacts to trip in 0·03 second on 8, 10, 12 or 14 times the full-load current for short-circuit protection. The bi-metal overload releases B have an accuracy within ±3% of the setting and are automatically compensated for varying ambient temperature between −10°C and +60°C. The trip also operates in the event of single-phasing. The time-current curves for this relay are given in Fig. 4. Separate protection may, however, be desirable to guard against faulty starting of an unattended automatic motor.

Incorrect Voltage

Whilst a motor may be used on a drive which is not normally liable to mechanical overload, it may, nevertheless, take an increased current if the voltage is incorrect. On a given load the motor current may increase approximately in inverse ratio to the voltage if this is reduced. An under-voltage release may trip at 85% voltage but this may allow up to 18% overload current if the motor is fully loaded, which may be too much for a c.m.r. motor.

Similarly, a motor may take an excessive current if the applied voltage is too high, especially if the motor has been designed with a fairly high magnetic flux density. The increase of flux density in parts of the core on increased voltage may then result in core saturation with appreciable increase of current and heating, even when not fully loaded. Protection against low or high voltage can, however, be given by closely-set overload releases of accurate calibration.

After a motor has been run up to speed, and its I^2R losses have fallen, the temperature-gradient through its insulation is reduced. Fig. 5 shows that after running on full load for a short

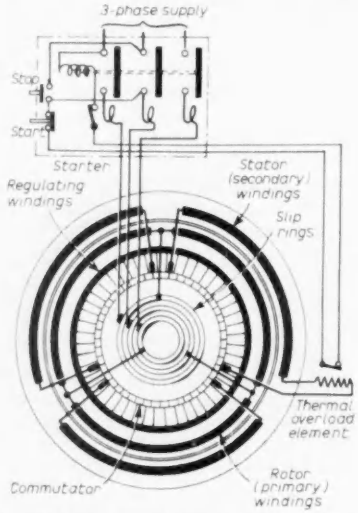


Fig. 6. Connections for a three-phase Schrage motor

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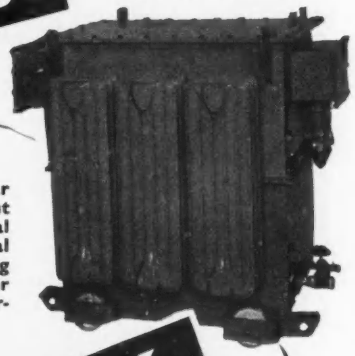

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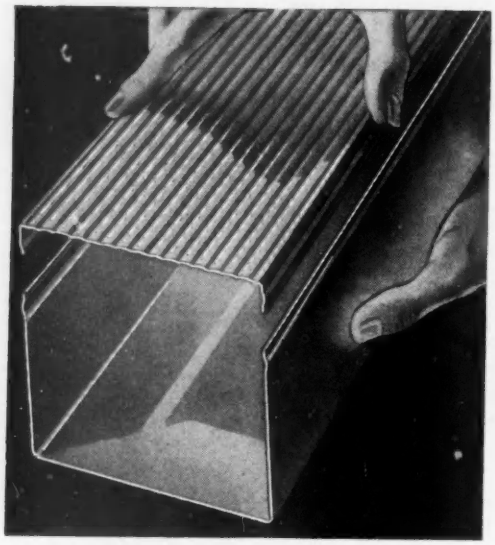

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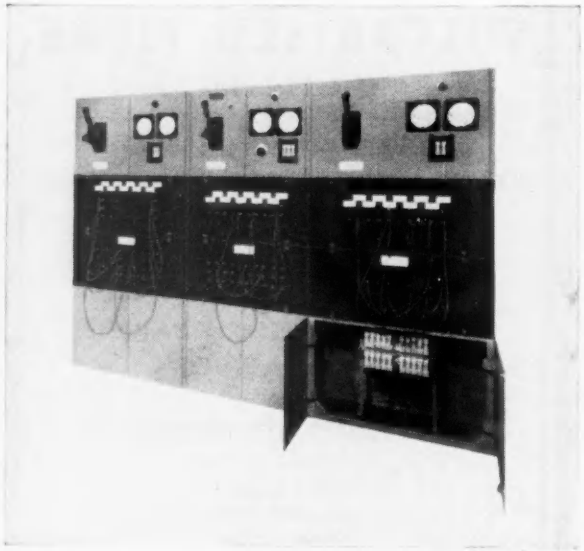

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time the temperature of the core and frame of a small totally enclosed induction motor may be within 15°C of that of its windings, although a much higher temperature-gradient is likely during starting.

Duty Cycles

Difficulty may be experienced in using overload releases to provide efficient protection for a motor which is used on a load that varies over a wide range at short intervals, without the releases tripping prematurely. The I^2Rt heating of the motor will depend on the cumulative effect of the duty cycle, which can hardly be sensed by an external overload release. A short-time rated motor is also likely to overheat if used for more than the rated period on its rated load, or if used too frequently.

Induction-type relays, of somewhat similar construction to an integrating wattmeter, may be used in some cases. However, in the absence of an overcurrent device having similar characteristics to the motor during heating and cooling, it appears that a close measure of protection against overheating under widely varying load conditions, or incorrect use of a short-time rated motor, is possible only with a temperature-operated device. One or more such devices of low heat capacity, secured to the stator windings, might control contacts in the operating circuit to trip the starter should overheating occur. Such a device would also protect a motor against overheating resulting from faulty ventilation.

Table I. Maximum temperature of various classes of insulation and temperature-rise of a.c. motors

Class of insulation	Maximum operating temperature	Permissible temperature rise for stator windings, armature windings, rotor windings connected to slip rings (other than salient-pole windings) and iron cores in contact with windings
A	105°C	55°C
E	120°C	65°C
B	130°C	75°C
F	155°C	95°C
H	180°C	115°C

Protection of Polyphase Commutator Motors

The primary current of a polyphase commutator motor, such as a Schrage motor, depends on the horse-power loading, i.e., on the product of speed and torque. Thus, line-connected overload releases can be used to protect such a motor against overload at high speed. But, since the secondary current of such a motor depends mainly on the torque, these windings may be damaged by overheating caused by overload when running at low speed, even though the primary current is less than the tripping value of the line-connected overload releases. To protect the secondary windings, a thermal overload release, heated by the secondary current, may be fitted to control contacts in the control circuit, as in Fig. 6. (*To be continued.*)

Electrothermal stress relieving on bridge girder

THE stress relieving of very large or long welded fabrications can present quite a problem if suitable furnace accommodation is not available. This difficulty arose recently after the fabrication of four huge steel girders at the Chepstow works of the Fairfield Shipbuilding and Engineering Co. Ltd., for the new Runcorn-Widnes road bridge, which will ultimately replace the existing old-fashioned transporter bridge. Each completed girder was approximately 80 ft long by 6 ft high and weighed in the region of 14 tons. They were welded fabrications with $\frac{3}{4}$ in. thick webs and $1\frac{1}{2}$ in. thick flanges, and stiffened at regular intervals with 8 in. by $3\frac{1}{2}$ in. by $\frac{3}{8}$ in. angles. For convenience of manufacture each girder was fabricated in two separate 40 ft lengths which were then welded together to produce the complete 80 ft girder.

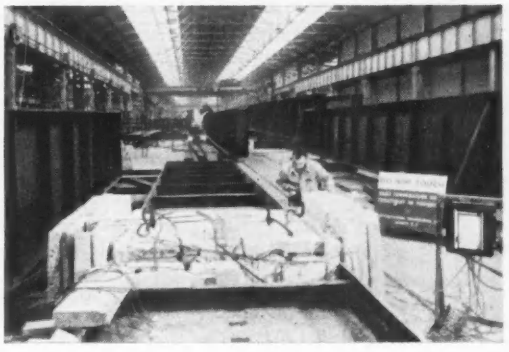
Because of their importance as main load-carrying members, stress relieving procedure on the weld joining the halves of the girders was to a strict specification. This was laid down as follows: (1) heat to 650°C at a rate not exceeding 150°C per hour, (2) soak for a period equivalent to one hour per inch of the thickest part of the heated area, (3) cool to 350°C at a rate not exceeding 100°C per hour and, finally, (4) allow to cool naturally to room temperature.

No conventional furnaces capable of accommodating such large girders were available at the Chepstow works and Electrothermal Engineering Ltd. were invited to undertake the stress relieving operation, using their "Flexible Furnaces." These are mats comprising ceramic beads threaded on "hairpins" of nickel alloy resistance wire, the latter being linked together to form a series of electrical circuits capable of attaining a maximum mat surface temperature of 1,000°C. Each circuit is provided with flexible leads and, by bringing in or cutting out circuits, it is possible to control mat temperatures to close limits.

Problems Involved

Before commencing treatment, it was necessary to give careful consideration to problems arising from the close temperature cycle specifications, the considerable mass of metal involved and the large surface area from which heat could readily be dissipated. In particular, Electrothermal engineers had to determine: (1) the heat input required, (2) the power necessary to provide this heat, and (3) the lagging necessary to conserve the heat input. Because of the weight and size of the girders, the services of two cranes were required each time they were moved: consequently forward planning of the movement of girders was essential since the cranes were also employed on normal shop work and were not always readily available.

Applying the elements and insulation to the weld area



General view showing girder in process of stress relieving

Heat Input

It was recognised that, while the flexible furnaces were capable of attaining a maximum temperature of 1,000°C and could dissipate 50 W/sq in., they would have to be considerably under-run to keep to the specification. The dissipation actually used was under 25 W/sq in.

Power for heating was supplied by two standard 300 A Quasi-Arc and two English Electric 350 A welding transformers. By means of a standard earth clamp, the end of each transformer lead was coupled to a copper busbar to which were connected leads from several mats.

Thermal Insulation

Four-inch thick slab-type thermal insulation material was employed for lagging purposes. Two types were used, the primary lagging (adjacent to the metal surface) being capable of withstanding temperatures up to 800°C; the outer, or secondary, lagging had an upper limiting temperature of 500°C-600°C.

Before commencing lagging, it was necessary to fix the size of the area to be lagged, the number and position of the heating mats, and the number and position of the thermocouples used for temperature control purposes. These details were then marked on the girder.

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Any tendency for one area to heat more rapidly than another was corrected by cutting the appropriate mats or sections out of circuit. When the temperature in all areas reached approximately 575°C, i.e., about 75°C below soaking temperature, current was reduced to avoid any chance of over-shooting the maximum temperature. It was found that interpretation of the curves shown on the recorders enabled the operators to judge the change of settings required with great accuracy. After the soaking period the cooling-down stage again amounted to little more than intelligent interpretation of the recordings, the elements being switched on or off as necessary to maintain a steady rate in each area. When the temperature had fallen to 350°C all heaters were switched off and the entire assembly allowed to cool naturally without disturbing the lagging.

The accurate control of temperature at all stages was undoubtedly influenced considerably by the careful attention paid to the lagging operations. Heat losses were minimised and, more important, temperature gradients throughout the girders were comparatively small. In view of the size of the girders, the mass involved and the considerable surface area, problems could readily have arisen if the lagging had been skimped or done carelessly, and a good deal of the success of the heat treatment was definitely attributable to the amount of time and forward planning given to the question of thermal insulation.

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At the commencement of the heat treatment cycle the rate of temperature increase was slower than that called for by the specification. This was done deliberately since, on switching on, several things happen before the heat is actually transferred to the girders in a manner which will give proper heat treatment throughout the cycle. The low rate of heat input provided a fair amount of time for the thermal inertia of the flexible furnace, the lagging and the girder to be overcome and reduced the possibility of major temperature gradients from one face of the girder to another, or from one side of the flanges to the other, to an absolute minimum.

After running the heaters up to about 200°C the rate of temperature rise increased, but was still kept within specification limits.

From previous remarks it will be evident that intelligent interpretation of the curves and anticipation of what was going to happen was an essential prerequisite in judging a subsequent stage in the operation; at the same time it was necessary to keep in mind the overall picture of what was already happening in the entire area being heated. Patience had to be exercised, since hasty alterations could have thrown the complete heat treatment cycle out of balance. As it was, stress relieving in these important major load-bearing fabricated girders was successfully carried out with the minimum of delay and, by the use of existing electrical equipment such as the welding transformers and Electrothermal mats, without the considerable expense which a special furnace of conventional type would have involved.

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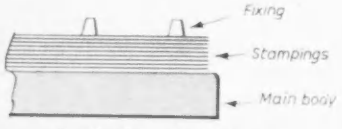

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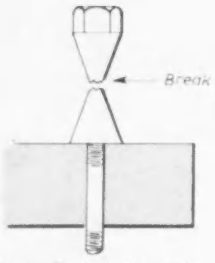

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The theoretical efficiency of these cells has been put at 20%. Earlier types of the cell developed by the Bell Telephone Co. in 1954 had an efficiency of 6%. Since then further development by International Rectifiers has enabled their efficiency to be raised to 14%, although yield at this efficiency is very small. However, cells are available in commercial quantities with efficiencies of 12%.

The cells are formed by diffusing a layer of P-silicon into an N-silicon wafer. The diffusion process requires careful control and is carried out in a boron atmosphere.

Each cell measures 2 cm by 1 cm and weighs only 0·2 gm. A cell having a conversion efficiency of 12·7% would have an optimum power output of 22·8 MW at 0·46 V when subjected to radiation of 100 MW/cm^2.

The output of silicon cells arranged in groups varies with changes in light intensity over their surface and although the silicon coating is impaired by a dust layer, it is not damaged by exposure to normal weather conditions. However, it may be affected by high temperatures and certain types of radiation.

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Heat Input

It was recognised that, while the flexible furnaces were capable of attaining a maximum temperature of 1,000°C and could dissipate 50 W/sq in., they would have to be considerably under-run to keep to the specification. The dissipation actually used was under 25 W/sq in.

Power for heating was supplied by two standard 300 A Quasi-Arc and two English Electric 350 A welding transformers. By means of a standard earth clamp, the end of each transformer lead was coupled to a copper busbar to which were connected leads from several mats.

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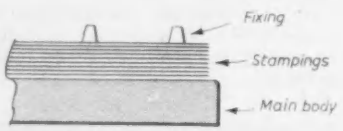

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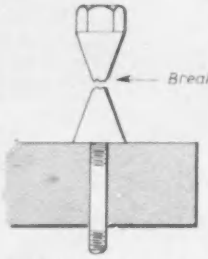

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NEW LITERATURE

Theory and design of inductance coils

by V. G. Welsby, PH.D., B.SC., M.I.E.E.

EVERY practising electrical engineer is, at some time in his career, faced with the problem of designing an inductance coil. Though the elements of design are taught us in our student days, it is a fact that in practice we are inclined to rely on rough and ready methods or on tables prepared from previous designs by colleagues and predecessors in our position. This may be quite satisfactory for the heavier, low frequency duties, but it will lead to insuperable difficulties and much waste of effort and time in electronic applications where only small tolerances at radio frequencies are permissible. Dr Welsby has, therefore, performed a valuable service in preparing this volume for the advanced student and practising designer and the success of the first edition when it appeared in 1950 was assured almost overnight. In the second edition he has included a chapter on the fundamental theory of magnetic field behaviour, largely to assist the engineer engaged on microwave radio techniques and the design of wave guides. Another familiar feature of second editions these days is the conversion of the units in the equations to the m.k.s. system. It may confidently be predicted that this volume, too, will be well received. Published by MacDonald and Co., second edition. 226 pages, 8½ in. by 5 in. Price 30s.

Practical residential wiring

by John F. Novak

THE first impression of an electrical engineer versed in our own IEE regulations on picking up this book is one of intense shock. Written for the American electrician for use on systems where the domestic voltage is normally 110-115, it is based on the current National Electric Code. This, apparently, does not recognise the necessity of earthing the framework of domestic appliances and the three-pin plug and socket connection, today a "must" in every British home, is barely mentioned. On the subject of socket-outlets in houses, the code calls for one outlet for every 12 linear ft of gross distance round the room, spaced equidistant apart and, in the laundry alone, at least one three-pole outlet "of the grounding type for the connection of laundry appliances."

Why, then, is this book appearing on the British market when it obviously does not apply to British practice? One answer is that, thanks to American influence overseas, both the practices and voltages in common use in the States are also in use in many other countries where British contractors may be competing for installation work. Obviously, to work to IEE standards would be to load the dice against us in competition with American tenders. Contractors proposing to enter these markets will, therefore, find the book invaluable. For the rest, it serves as a useful basis of comparison with British practice, that is all. Published by D. van Nostrand Co. Ltd., second edition. 498 pages, 9 in. by 5¼ in. Price 60s.

Diffraction gratings as measuring scales

by J. Guild,
O.B.E., A.R.C.SC., D.I.D., F.INST.P.

THE very rapid developments which have taken place in the last few years in applying diffraction gratings to precision measurement and control on machine tools and other industrial applications has created a need for authoritative bibliography on the subject. The author, who has been closely associated with the development since it was first initiated as part of an NPL research programme, has done much to satisfy this demand, first with his earlier work "The Interference Systems of Crossed Diffraction Gratings" and now with the present volume. To many, the phenomenon of light and dark bands created by the interference of two displaced gratings is purely a mechanical one. This may be true if the gratings are of coarse pitch, but, where fine pitch gratings are used, diffraction takes place and moiré fringes occur which need special interpretation and understanding. This book sets out to explain how these fringes come about and how they can be applied to the accurate measurement of distances with an accuracy of up to a twenty-thousandth part of an inch. Higher accuracies are possible—up to a fifty-thousandth part of an inch—but this involves the use of monochromatic light and is not, as yet, applied industrially, at least outside standardising laboratories. Published by Oxford University Press. 206 pages, 8½ in. by 5¼ in. 43 illustrations. Price 35s.

BRITISH STANDARDS

Cables and Flexible Cords. *BS 3249 : 1960. Price 5s.* The full title of this standard is "Cables and Flexible Cords insulated with Varnished Cambric and Heat-resisting Fibre." It is, in fact, a new standard replacing that part of BS 1327:1946 dealing with flexible cords incorporating varnished cambric and asbestos. The reason for its introduction is that vulcanised natural rubber is now an obsolescent insulating material for heat-resisting cables. Two other new standards are in course of preparation dealing with butyl rubber insulated and silicone insulated cables and cords and, when these are issued, BS 1327 will be withdrawn.

The present standard has been extended to include glass fibre and polyethylene terephthalate fibre as well as asbestos and the cables are intended for dry situations where the normal temperature does not exceed 85°C.

Test Methods for Bitumen. *BS 3235 : 1960. Price 8s 6d.* The purpose of this new standard is to collect into a single volume a number of the authoritative test methods for bituminous compounds. In the foreword initial reference is made to "bitumen-containing compositions used in the building, road engineering and electrical industries" and the inference is that the methods refer to all classes of such compositions. In fact, none of the more important tests for electrical compounds are included and, for the electrical industry, BS 1858:1957 will remain the relevant standard for reference.

Properties of Steel at Elevated Temperatures. *Pt. I. Proof Stress. BS 3228 : 1960. Price 3s.* One of a series of standards relating to procedures for obtaining data to determine the properties of steels at elevated temperatures, this deals with the aspect of proof stress which depends on the method of manufacture, composition, heat treatment and ruling section.

Phenolic-Resin Bonded Asbestos-Paper Sheets for Electrical Insulation. *BS 3253 : 1960. Price 6s.* An addition to the range of standards dealing with synthetic-resin bonded sheets for electrical purposes, this standard deals with asbestos laminates from 1/64 in. to 1 in. thick for d.c. or a.c. electrical appliances. In the case of a.c., the upper limit of frequency is 100 c/s. It follows the general plan and practice used in the other similar specifications (1137, 1314, 1885, 1951 and 2076) and the tests conform to those laid down in BS 2782.

Copies of British Standards noted above may be had from the BSI (Sales Branch), 2 Park St, W.1, at the prices stated. Postage is charged extra to non-subscribers.

BOOKS RECEIVED

Mathematics for Telecommunications, Vol. II, by D. F. Spooner and W. H. Grinsted. Text for third and fourth years of City and Guilds telecommunications technicians' course and ONC courses. Published by English Universities Press Ltd., 514 pages, 7¼ in. by 4½ in. Price 15s.

The Uses of Electricity in the Oil Industry, ed. by E. A. Reeves. Collection of articles by specialist engineers on installation and operational practice. Published by Ernest Benn Ltd., 296 pages, 9 in. by 5¾ in. Price 50s.

Direct Conversion of Heat to Electricity, ed. by J. Kaye and J. A. Welsh. Papers presented to a special course organised at the Massachusetts Institute of Technology in July, 1959. Includes papers on thermionic engines, magnetohydrodynamic converters, semi-conductor devices and fuel cells. Published by Chapman and Hall, 356 pages, 9 in. by 5¾ in. Price 70s.

Standardisation can cripple exports

By J. A. Robbins, B.Sc. M.I.E.E., A.M.I.Mech.E.*

DURING the past few years we have continually been exhorted to increase and foster our export trade, and manufacturers of electrical equipment certainly cannot be accused of failing the nation in this respect. Yet even in our electrical industry it is fatally easy to ignore certain aspects of exporting which may eventually result in market after market being closed to us.

With the larger capital goods class of equipment, the major export problem is very often the question of long-term credit facilities in the country concerned: the question of meeting the technical specification is usually of secondary importance. Indeed, quite often British consultants have been responsible for drawing up the specification in the first place.

Where, however, the smaller consumer type of equipment is concerned, there is an unfortunate tendency to assume that all that is required is commercial salesmanship: to assume that the business of exporting begins and ends with the commercial decision as to whether to operate through local agents, or to have direct representation. Furthermore, even if local agents are employed, there is a strong school of thought that the whole business can be handled by correspondence.

The "Standards" Barrier

Whilst this may perhaps have been true some years ago, the picture is changing rapidly. More and more countries are realising that a State testing station can be a far more effective barrier to imports than a tariff wall—and that a carefully written, ambiguously worded national standard can be used as an impenetrable shield to protect the local manufacturers.

This state of affairs is not restricted to any particular area of the globe. At a fairly recent European Standardisation meeting, the representative of one of the countries present openly admitted, during the discussion, that their State testing station never passed or accepted anything from abroad if they could possibly avoid it. Elsewhere in the world, equipment has been rejected by a Commonwealth testing authority as not complying with their national standard—in that it was not completely and absolutely "dustproof." Yet some of the locally produced equipment, freely on sale in the country concerned, makes no pretence whatsoever to being dustproof.

As we have no State testing station and, effectively, no mandatory standards, many maufacturers in this country have had no direct experience of this state of affairs. Indeed, in recent months we have read a lot in the technical Press about the dangers of imported electrical equipment using a different colour coding for cables and in particular of using colours such as red for the earth core. Unfortunately, there seems to be no really effective way of prohibiting the importation of such equipment into Britain, but the author has no doubt whatsoever as to the fate of any British manufacturer attempting to export to, say, Norway or Australia if the equipment in question failed in some essential particular to comply with Norwegian or Australian practice.

What Do the Test Figures Mean?

Thus, the first major export problem is that of apparently preferential treatment of local products: of differing interpretations of accepted national standards by State testing stations. Allied to this is the problem of differing testing procedures for the same article in various parts of the world.

As a specific example of this, British manufacturers of large circuit-breakers have suffered for years from unfavourable comparisons between their units and American designs, simply and solely due to differing methods of assessing short-circuit breaking capacity ratings.

The breaking capacity of British circuit-breakers has always been based on r.m.s. values of prospective current: but comparable American values included a substantial asymmetrical component. As a result, an American circuit-breaker always had, on paper, a substantially higher breaking capacity rating than its exact British equivalent.

Finally, there is the clear-cut problem of foreign standards being written in such a manner as to exclude equipment made in accordance with accepted British Standards. This forces our manufacturers to make specially for the country concerned and, in consequence, they lose all the economic advantages of a thriving home market.

Technical Representation Essential

Clearly, therefore, more commercial salesmanship is not sufficient, in itself, to expand—or even to retain—our export markets. More and more attention must be paid to technical problems of standardisation and it is becoming vitally important that we are strongly represented at all international standardisation meetings.

What is more, it is not enough that our representatives are men of high technical calibre: they must also be men who are prepared strongly and vigorously to speak for Britain. Only in this way can we ensure that international standards are not drafted in such a way as to conflict with sound British technical practice: only in this way can we ensure that the "Battle for Exports" is not finally and irretrievably lost—not actively in the world's commercial markets—but quietly and unnoticeably in technical committee rooms.

Who Speaks for Britain?

Obviously, the major responsibility for effective representation must devolve upon the manufacturers directly concerned. In practice, this has usually meant a few public-spirited manufacturers individually meeting the expense of sending people to the relevant international standardisation

* Mr Robbins is with J. A. Crabtree.

meetings—there to represent the entire section of British industry directly concerned including, very often, their active competitors.

In this particular respect, the author has possibly been somewhat fortunate in that, at most of the conferences at which he has been present, British industry was reasonably strongly represented. As a result, the particular standards which were actively under discussion tend to embody the best feature of British technical practice and were written, at the time, in such a way that it was reasonably practical for British manufacturers to comply with the international standard without a major design modification and also without conflicting in any way with accepted British Standards.

This question of effective representation is something upon which other countries set great store and—in view of the present developments with regard to the Common Market in Europe—it is important to note that Germany, France and Italy are always strongly represented. At CEE Standardisation meetings, for example, Germany normally has at least eight people present at each session and it is by no means uncommon for there to be two, or possibly more, people present from the same German firm.

In contrast, the author has often seen the active British representation reduced to about three people, and at a CEE plenary meeting some 18 months ago he was the sole British representative present, out of a total of some 60 people from 13 different nations.

Quite obviously, unless Britain is strongly represented at such conferences, there is a grave danger that international standards will be drafted in such a way—either by accident or deliberate design—as either to exclude British equipment or, alternatively, to make it extremely difficult for British manufacturers to compete effectively in the world's markets. It is, therefore, most important for the manufacturers directly concerned to ensure that this strong representation exists, whenever standards which may in any way affect their products are being discussed.

It is no use piously hoping that the BSI staff can look after everyone's interests. Whilst BSI do a very fine staff job in ensuring that delegates are fully documented, it is clearly completely unfair to expect anyone but the manufacturers themselves to assess exactly how an "off-the-cuff" proposal, made in the hurly-burly of an international meeting—often in halting English or, even worse, in fluent idiomatic French—will affect designs, production processes, or production costs. If British manufacturers do not want to see themselves standardised out of the export market, they must ensure that they are adequately represented at such conferences.

The Essential Qualifications

What qualifications, then, should a delegate or technical representative possess? A sound knowledge of the products or group of products under discussion is obviously essential. Next comes the question of languages. Most technical conferences these days are conducted in two languages, English and French. Whilst an ability to converse fluently in idiomatic and technical French would seem highly desirable, it is far more important, in the author's opinion, for the representative to be able to put forward Britain's point of view both strongly and clearly, in plain, simple English, even at the risk of sounding like a District Commissioner addressing the natives in the backwoods.

An ability to read technical French and to follow the trend of a discussion in French is normally reasonably adequate linguistic equipment for such conferences. Where necessary, an exact translation of any part of the discussion carried out in French is usually readily available.

By concentrating upon expressing ourselves in clear and simple English, however, we tend to create a considerable fund of goodwill on the part of most of the other nationalities present—as they are usually struggling desperately to follow the discussion in what is to them a foreign language. As a result, when differences of opinion do arise, there is a very natural tendency for them to fall in with a point of view so clearly expressed that they understand it fully, rather than side with an opinion so poorly expressed that it is only partially understood.

Minor Details Important

During the actual discussions, major differences of opinion do not often arise about fundamental technical requirements. Most countries, for example, are understandably in substantial agreement that a device rated at 10 A should be capable of carrying 10 A continuously and safely. Differences are far more likely to arise over points of application practice, such as sizes of cable or conduit entry, use of metric threads for screws, terminal markings, etc.

Hence, all classes—even the apparently unimportant ones—should be studied very carefully. This is particularly the case when dealing with specifications drafted by Continental countries. An apparently minor requirement that the handle position should be "up" for "on" in one draft Standard could easily have kept a number of makes of British m.c.b's off the Continental market. What is more, this requirement was only removed from the relevant draft Standard in the face of considerable opposition. Yet one of the countries which strongly opposed the deletion of this requirement was even more strongly opposed to the retention of another clause, stating the apparently fundamental requirement that it should not be possible for the handle to indicate "off" unless the contacts were in the open position!

It is also necessary to keep a very close eye on testing clauses and testing procedure, as these can often make compliance with a relatively simple basic technical requirement a virtual impossibility. This position is certainly not helped by the fact that the various Continental national State testing authorities are usually strongly represented at standardisation conferences and, rightly or wrongly, some of them seem to act as though they have a vested interest in making tests both difficult and complicated to an unrealistic degree. Henry Ford demonstrated many years ago that it was not essential to have a Rolls-Royce in order to motor, in relative safety, from point A to point B: but the author has a distinct impression that certain testing stations would not be hard-pressed to find a reason for failing a Rolls-Royce on the grounds of safety, whilst happily driving about in locally produced boneshakers!

Fortunately, common sense usually prevails in such discussions, although the author can recollect a very prolonged argument—extending over several conferences—with some countries who wanted to wrap circuit-breakers in cotton wool whilst carrying out short-circuit tests, to check for flame emission. While certain manufacturing countries supported the British viewpoint that the flammability of cotton wool made this an unrealistic test, the issue was not finally settled until one of the British delegates deliberately ignited some cotton wool to illustrate the point: and then promptly—but quite involuntarily—swept the whole blazing mass into a German delegate's lap! When order was restored, Germany led the opposition to the use of cotton wool!

On a somewhat similar occasion after a long discussion a Netherlands delegate, opposing a Danish pro-

posal, said that "if this proposal is really necessary, then—to quote a famous English poet—there is something rotten in the state of Denmark"!

Domestic Standards Important

There is one final aspect of this question of international standardisation which is of major importance. It is completely useless for British manufacturers actively to represent Britain's interests in foreign fields unless they are wholeheartedly supported in their actions when our own domestic standards are being written or modified. Here the author feels that there are many instances where British Standards or, possibly, British practice, could be brought in line with accepted overseas practice without in any way detracting from the traditional quality of our products. Unfortunately, this cross-reference to export requirements does not always take place and so months and possibly years of work may be completely nullified and frustrated.

As a specific example, BS 842 (Voltage-Operated Earth-Leakage Circuit-Breakers) implicity permits operating currents ranging from 15 mA to 80 mA. Over the past four years, a CEE Standard has also been prepared for these units, British manufacturers taking a very active part in this work. During the series of meetings it was agreed, after considerable discussion, that there were sound technical reasons for limiting the minimum current to 35 mA, the effective CEE range consequently being 35 mA to 80 mA.

Yet in the meantime the IEE, without any direct reference to the manufacturers concerned, issued their "Recommendations for Electrical Installations in Caravans." In this it is explicitly stated that a BS 842 e.l.c.b. is to be used, but the e.l.c.b. operating current must not exceed 40 mA!

Thus, in this instance, British manufacturers are now faced with the choice of trying to design to the arbitrarily and unnecessarily restricted operating-current range of 35 mA minimum (CEE) to 40 mA maximum (Caravan Requirements); of abandoning the hard-fought-for export market; or of ignoring the IEE recommendations.

If, then, we are seriously intending to battle for the export market, it is first absolutely essential that British manufacturers are actively and vigorously represented at each and every international standardisation meeting. In addition, however, it is equally essential that the requirements of the export market are kept firmly and clearly in mind when drafting or modifying British Standards. As far as possible, our domestic standards should be written in such a way as to allow full scope for British traditional skill and ingenuity in design whilst at the same time being in no way restrictive upon British manufacturers endeavouring to compete freely in the world's markets.

Then, and only then, can we feel we are fighting our export battle on level terms with our competitor nations. If not, then irrespective of any commercial manoeuvrings, we shall find market after market quietly but inexorably closed to us—simply and solely because we do not comply with some obscure clauses in international or local standards.

Dragon makes progress

CONSIDERABLE progress made on the DRAGON project high-temperature gas-cooled reactor (HTGC) is outlined in the annual report on the scheme. The report also records the negotiation of an agreement with the US Atomic Energy Commission for a full exchange of information with their team engaged on a similar project at Peach Bottom, Pennsylvania.

The report is published by the European Nuclear Energy Agency, for it will be recalled that DRAGON is a combined research project undertaken by the OEEC.

Civil construction work began on the site at Winfrith Heath in 1959. Several important contracts have so far been approved for the reactor itself in addition to those for civil work. These include construction of the pressure vessel, thermal shields and containment building and the high temperature fuel experimental and development plant.

Estimated Cost

DRAGON is estimated to cost, ultimately, £13·6 million; £10 million will be borne by the seven signatories to the agreement, with the largest shares, both 43·4%, being met by the UKAEA and Euratom. The UKAEA will provide additional expenditure, if required, up to £3·6 million and they will acquire the plant at the conclusion of a five-year period. The budget for the first year was £775,000, and for 1960-61 £2·83 million has been approved.

The DRAGON project has two aims, first to carry out research and development with a high-temperature gas-cooled reactor, and secondly to investigate design construction and operation problems at high temperatures of a reactor with a heat rating of 20 MW.

The HTGC is an attempt to reduce the cost of nuclear power by applying the technology of the gas-cooled reactor at temperatures and pressures above which the advanced gas-cooled reactor (AGR) can operate. The HTGR promises to be the most likely source of nuclear power for the 1970s.

Many features of the design which differ from earlier reactors call for a considerable preliminary experimental programme. However, progress has enabled the building and civil engineering design to be settled. Some of these tests have been carried out at Harwell in the BEPO and DIDO reactors. In addition to the work at Harwell, fuel irradiation experiments are planned, using Danish, Swiss, Dutch and Swedish reactors.

"Dragon's" statistics	Units	
Thermal rating	MW	20
Coolant pressure	lb/sq in.	294
Inlet/outlet coolant temperature ...	°C	350/750
Core equivalent diameter	ft	3.5
Core equivalent length	ft	5.25
Mean power density	MW/m³	14
Mean heat flux on fuel element surface	W/sq cm	24

The work involves high-temperature or high-neutron fluxes to be available. The British reactor ZENITH which, it will be recalled, is a zero energy project, is now in use for investigating reactor physics of DRAGON.

The DRAGON project will use helium as the gas coolant operating at temperatures up to 750°C. Such high temperature requires an extensive study of fuel canning techniques. The usual canning materials are inadequate at high temperatures and it has been necessary to develop special high impermeability graphite to contain the fuel.

for the electrical trade

Blanket thermostat price

EKCO, who recently introduced the "Ekcostat" room temperature thermostat control at £1 16s 6d for use with electric blankets, announce that the price is to be £1 12s 6d and not £1 16s 6d as originally stated. The "Ekcostat's" introduction coincided with extensions of Ekco's own blanket range, "Warmglow."

All-glass sealed headlights

DURING 1959 the term "sealed-beam lamp" came into the news when GEC, AEI and Lucas formed a joint company, British Sealed Beams Ltd. The Osram Lamp Division has now, 14 months after this consolidation, announced the introduction of the first sealed-beam headlamps to be manufactured or marketed in this country.

The new headlamp, which has been used extensively in America, is a glass reflector welded to a refractive lens with a double transverse tungsten filament sealed into the reflecting surface. The whole unit is gas-filled forming in effect one unified lamp. Electrical contacts are built into its rear. The two primary advantages of the new headlamp are the elimination of the "blind spot" behind the filaments, and the protection afforded against dirt and moisture. Reflector lamps did, in fact, make a fleeting appearance well over 25 years ago, but the advent of this unit proves that the trend toward their use in directional lighting applications is now well under way. *General Electric Co., Magnet Hse, Kingsway, W.C.2.*

Tube-lamp fitting

A FLUORESCENT batten type fitting designed for domestic appeal, "Slendora," does away with control gear by incorporating a tungsten ballast lamp. Basically this is the simplest type of tube fitting, the actual batten/channel being slimmer than the tube itself with short tubular end caps. A yellow cylindrical shade is placed off-centre to house the ballast lamp which is situated under the tube. The whole effect is about as neat as can be expected from a tube batten fitting, the ballast lamp adding a welcome decorative touch apart from its functional advantage. Consumption of this fitting is about 100 W, light output being equivalent to three 75 W lamps. Price, complete with Osram 40 W 4 ft warm-white tube, £3 5s tax paid. *The General Electric Co., Magnet Hse, Kingsway, W.C.2.*

RPM off two 'fridges

RESALE Price Maintenance restrictions on Kelvinator's K46MT and MTC refrigerators will be lifted in September. This withdrawal of RPM accompanies an offer of 7½% discount on those stocks remaining in Kelvinator's warehouses. Meanwhile the two models have been taken off the production line pending the introduction of a modified and improved K46MT "Zero-Plus" with low temperature freezer-chest.

Domestic infra-red

THERMODARE'S first venture into the domestic infra-red heater field has resulted in their 77 and 100 high mounting fires. Both versions feature a safety guard which swings down allowing access to the reflector for cleaning. Angle can be adjusted vertically by end-knobs. The fire is fitted to the wall by a kind of hinged plate, so that when the end knobs are completely removed the fire rotates downward on the hinge, turning its face to the wall. A small warning arrow lights up on this backplate if the fire is accidentally switched on. The two models, 750 W and 100 W, respectively, are both cord operated. Element tubes can be replaced for 1s each. Dimensions: 25¾ in. long, 6¼ in. deep and 4 in. high. Prices, £5 5s and £5 12s 6d. Finish: grey body with off-white ends. *Thermodare (Great Britain) Ltd., 90-94 Petty France, S.W.1.*

Triple heat/speed fan

A THREE-HEAT fan with three speeds for each heat seems excellent value for only £7 9s 9d tax paid. The heater to offer these features is an imported model, "Komet." It was first introduced toward the end of last season, but has been brought up to date now by the addition of a safety cut-out device and a pilot light. The circular body is mounted on a tubular stand, which can be used for hanging it on a wall hook or as a freestanding support. It swivels freely through 360 degrees, allowing air to be directed at will. Its total 2 kW rating steps down to 1¼ kW or ¾ kW. "Komet" carries a one-year guarantee. Distributors, *David C. Lesser and Co., 510 Coventry Rd, Birmingham 10.*

Built-in wall 'fridge

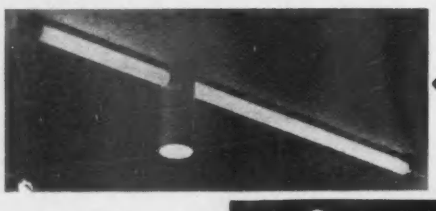
A DIMINUTIVE built-in refrigerator of 1·6 cu ft capacity has been introduced under the "Astral" label. Recommended for building into a wall at eye-level, it is an absorption type model incorporating a freezing compartment, two shelves and the usual door racks for eggs and bottles. The cabinet is fitted with ventilators at top and bottom which are finished, like the rest of the front casing, in white or cream stove enamel. Interior and drip tray are of polystyrene. This refrigerator is 21 in. wide and 31 in. high, including the ventilator outlets. It weighs 75 lb. Price of the new model, A.160 B, is £35 10s tax paid. *Morphy-Richards (Astral), 50 Conduit St, W.1.*

TRADE PUBLICATIONS

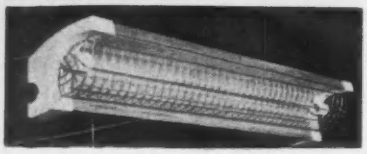
WOLF.—Lists FL/59 Flame Safety Lamps and A/1 on "Airturbo" lamps S.S.S. additions to loose leaf catalogue. Wolf Safety Lamp Co. (Wm. Maurice), Sheffield 8.

BG.—16-page illustrated catalogue of insulated electrical accessories. British General Mfg. Co., 38 Glasshill St, London S.E.1.

LANGLEY.—July News Letter No. 5, 1960. Langley London, Kelvin Way, Crawley.



The "Slendora" tube fitting with ballast lamp, £3 5s, gives about 3,000 lumens for its 100W consumption



Thermodare's domestic infra-red fire. £5 5s and £5 12s 6d

The "Astral" 1·6 cu ft wall 'fridge. A built-in model weighing 75 lb. A.160B, £35 10s

equipment for industry

Hot chicks

COSY conditions for chicks are obtained with a thermostatically controlled brooder which maintains an even temperature. The brooder incorporates four "Radsil" heaters with a total rating of 2·9 kW, said to be simple to install and easy to clean and can be varied in height above the brooding floor. The brooder thermostat can be positioned to maintain constant house temperature, or constant temperature in the brooding area itself. Maintaining an even temperature during the winter months is claimed to give an extremely low mortality rate at a power consumption of only 1·2d per bird. *Electronic Poultry Aids Ltd., Kimpton, Hitchin, Herts.*

Chart recorder for Watts and Vars

A CHART recorder for measuring both the in-phase and reactive power consumption of electrical equipment is one of three introductions to this country from America recently announced.

The chart recorder registers watts and vars on a single chart enabling the overall consumption of industrial plant to be plotted over a working period. The recorder is housed in an attractive compact case, suitable for carrying, and is used in conjunction with a hook-on current transformer. This transformer can be hooked over cables without disconnecting them or interrupting the service while the circuit is being tested.

For the protection of dry transformers and rotating machinery certain advantages are claimed for the Form 28 lightning arrester which is now available. Advantages of this type of arrester are claimed to be a reduction in front-of-wave sparkover by 30% compared with conventional arresters, made possible by the use of pre-ionised gaps. The arresters are made from thyrite and typical performance for arresters is shown by a 3 kV arrester with an impulse sparkover of 11 kV, while for a conventional arrester the value is said to be 16 kV.

A new range of low current silicon controlled rectifiers are claimed to be competitively priced when compared with power transistors for switching applications. Eight models are included in the type SCR series having glass-top design, a feature providing long creepage path. These controlled rectifiers have peak inverse voltages from 25 to 400 and an average forward current rating of 4·2 A at 75°C. The maximum forward voltage at 3 A is 1·2 V. Reverse current is low and the maximum gate current and voltage to fire the device at 25°C are 15 mA and 2 V, respectively. *International General Electric Co., of New York, 296, High Holborn, W.C.1.*

Making machines mobile

WHY should machines be made mobile? Because machines which are not fixed permanently in position can be moved quickly and simply to suit changes in production line flow; because excavation for foundations and bolt holes with consequent time consumed may in many cases be avoided; and because maximum use may be made of available floor space, including space which would not normally be considered satisfactory for bolting down machines. All these advantages are claimed for the "Barrymount" levelling machine mounts which have the further valuable asset of reducing vibration transfer. Barrymounts were originally developed in the United States where they are used extensively for mounting machine tools, generating sets and transformers. Versions are also available, suitable as antivibration and shock mountings for instruments and electronic equipment. The Barrymount is a resilient support for machines which allows them to float without movement. A levelling device is incorporated to aid alignment. Several versions of the mounts are available for a variety of applications. *Cementation (Muffelite) Ltd., 20 Albert Embankment, S.E.11.*

Compact heat exchanger

ALTHOUGH originally developed for cooling mechanical shaft seals operating at high temperatures, the "Heat Dissipater" is claimed to have many other applications. The "Heat Dissipater" has a capacity of 10,000 B.Th.U/hr and is said to be suitable for a product pressure of 2,000 lb/sq in. and coolant pressure of up to 150 lb/sq in. The liquid to be cooled flows through a seamless stainless steel tube encased in a shell, which is also fabricated from stainless steel. *Crane Packing Ltd., Slough, Bucks.*

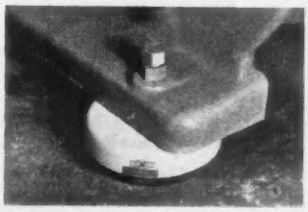
Crimping made easy

A SINGLE tool, resembling a pair of pliers, which cuts, strips and crimps wires is available from Hellermann. The Crimpmaster is supplied in a kit which also includes two boxes of assorted terminals. Wires are cut with a conventional cutter on the Crimpmaster and notches on the tool body are used for stripping. A further series of notches, with numbers corresponding to the crimp terminal is used for making the crimp. These tools can be used with wire sizes ranging from 12 to 23 S.W.G. *Hellermann Ltd., Crawley, Sussex.*

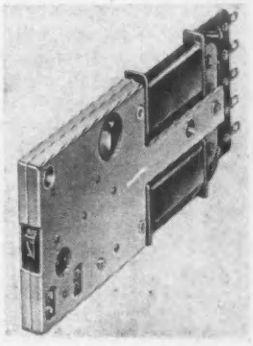
Counters for computers

A VERSATILE range of counters available in print-out and read-out form has been introduced for computers, counting machines and factory process control equipment. The counters have an operating speed of 40 impulses/sec. and operate on 240 V. Known as TMC Elmeg counters, they can be reset to zero by electrical, mechanical or electro-mechanical methods. The series includes an extremely slim, single decade counter with self-homing reset and also a six digit read-out counter with push-button reset and a variety of contacts. *Telephone Manufacturing Co. Ltd., Hollingsworth Wks, Martell Rd, S.E.21.*

The GEC chart recorder for simultaneous measurement of watts and vars, together with "hook-on" c.t.



The "Barrymount" flexible mounting for machine tools and electrical equipment is now available in this country from Cementation Ltd. The mount is claimed to eliminate many disadvantages of conventional mounts



TMC have added this extremely slim decade counter to their range

News of the Week

MANUAL GRADES CLAIM SETTLED

Seven wage classifications replace 108

WAGE increases of 3d/hr for labourers, 3½d for mates and 5d for craftsmen in the electricity supply industry were agreed by Electricity Council and union members of an NJIC committee last Friday. Some categories of workers receive larger increases as part of an overall review of the wages structure of NJIC workers, which has reduced from 108 to seven the number of grades for which separate hourly rates are allocated.

The settlement, which followed a lengthy meeting, was effective in removing the threat of unofficial strikes at power stations. One of the final points of difference between EC and union members was about the possibility of an eighth grade, to include labourers who had worked in the industry for less than one year; the Council had considered these should be paid less than long-service labourers and planned no increase for 5,000 or so men concerned.

Although it is over two years since a formal increase was awarded the NJIC grades, effective increases have come through improvements in sick pay (last October), increases in holidays (November) and a cut in the working week from 44 to 42 hours (December). EC negotiators have admitted that supply industry workers were relatively low paid compared with equivalent workers in other industries, but, earlier this year, they pressed for a general review of the wages structure with the intention of simplifying it and increasing differentials, and for a pause to collect evidence on the effect of the 42-hour week on earnings. When the unions were unwilling to accept this, arbitration resulted, with the arbitrator making an individual award (other members failing to agree) largely supporting the EC arguments.

Teams of engineers (without union participation) were set up by selected boards to evaluate the various manual worker grades and group them. The results were compared and consolidated, and were largely accepted by the unions.

Total cost of the increase to the industry is reckoned at £6 million in a full year. The increases will be effective in the first full pay week following 12 Aug.

Rates agreed range from 54d/hr for labourers, male office learners and ordinary gatemen, up to 66½d/hr for craftsmen and 71½d/hr for installation inspectors. There is a London weighting of 4d/hr extra.

GEC-EMI Link-up Rumours

REPORTS that a city banker is to make an approach to EMI for an amalgamation with the GEC are unlikely to be of substance. Both companies are declining to comment on the report, which has been much discussed in the Press. It is considered unlikely that any such approach would be successful.

Holme Pierrepont Objection confirmed

NOTTINGHAMSHIRE County Council Planning Committee has confirmed its decision to object to the plan for a power station at Holme Pierrepont. This decision follows meetings between the committee and the CEGB representatives at which technical arguments in favour of the site were discussed. The committee consider that the CEGB must be required to justify their proposal to erect the station on Green Belt land at a full public inquiry.

The committee have decided to grant consent to the CEGB's application to build a coal-fired station at West Burton subject to consultations in regard to detailed planning.

To gain more knowledge of the problems likely to be involved in the West Burton project, members of the appropriate sub-committee are to visit High Marnham power station.

Kelvinator R.P.M. Relaxation

KELVINATOR are releasing the trade from resale price maintenance obligations in respect of their 4·6 cu ft refrigerator (K46MT), but they are most emphatic that this is not a move to break the resale price maintenance structure. In a statement by Mr N. Saunders, Kelvinator managing director, the policy is announced of having all Kelvinators fitted with an extra-low temperature freezer chest, capable of maintaining temperatures between zero and +5°F. This should permit deep-frozen food to be kept for up to three months.

A 4·6 cu ft cabinet incorporating a low temperature freezer compartment is proposed with the name "Zero-Plus." Details of the model are promised on 1 Nov. For this reason, manufacture of the present 4·6 cu ft model is to cease at once. Withdrawal of price maintenance is claimed to be no more than a consequence of this.

Mr D. A. Welch, Kelvinator executive sales director, has written to DorDec making this point, saying that "our general policy continues to be to support the principle of price maintenance in respect of current models of refrigerators which remain in production."

To clear existing stocks, Kelvinators are offering the 4·6 cu ft model at an extra 7½% discount. Details are given on page 252.

Elliott link with Germany in Vacuum Field

ELLIOTT-AUTOMATION LTD. are forming a joint company between Elliott Bros. (London) Ltd. and Leybold's, of Cologne, Germany, said to be the world's largest group of high vacuum engineers. Under the title Leybold-Elliott, the new company will be British and have an initial issued capital of £100,000, with Elliott's holding the majority interest. It will exploit products of both parent companies throughout the British Commonwealth, except Canada. By reciprocal agreement the Leybold companies may market Elliott products in certain countries in Europe.

E. Leybold's Nachfolger, of Cologne, and its associated company, Leybold Hochvakuum-Anlagen GmbH, manufacture an extensive range of vacuum components including high efficiency rotary and diffusion pumps, gauges and other equipment. The latter firm has specialised in application of its equipment to particular requirements, including those of the electrical industry in the valve and cable fields.

The new company is holding a three-day exhibition of its products at the end of September in the London area. Invitations to this are obtainable from Leybold-Elliott Ltd., c/o Elliott Bros. (London) Ltd., Elstree Way, Boreham Wood, Herts.

CUSHY FOOT

Cushioning in all three planes

The great success of Cushyfoot anti-vibration mountings is due to a unique combination of features.

With different degrees of flexibility in vertical, transverse and longitudinal directions, they can be arranged to give exactly the right amount of cushioning in every plane.

The very high deflections available isolate low frequency vibration and reduce foundation costs for large machines by obviating inertia blocks of concrete, or permitting the use of much smaller blocks. Bolting down is not necessary when friction locating pads are used in conjunction with the mountings.

For unit loads up to 3,500 lb., the Cushyfoot is compact, robust and designed so that the rubber elements never lose their resiliency and are protected from oil and mechanical damage.

Please write for brochure illustrating the application of Cushyfoot mountings to diesel generators, power presses, screens, compressors and many other machines causing vibration or requiring protection from it.

METALASTIK

The NEW range of–

"MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.

10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.

This new range of "Memrex-Exel" switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.
Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

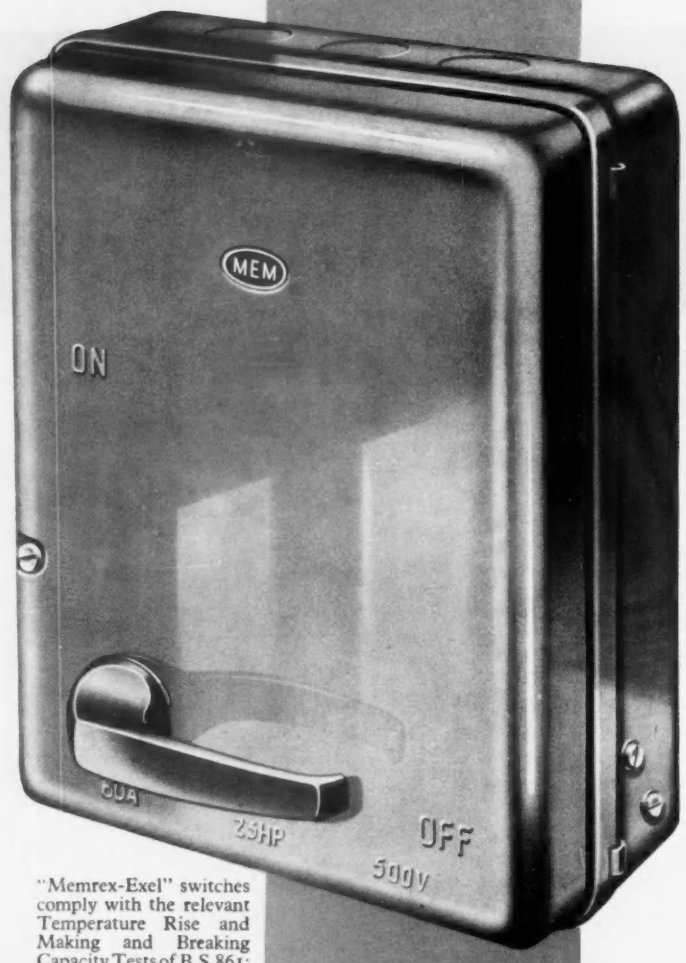
Fuses are of the new "Kantark-Exel" pattern which will accept rewirable or H.R.C. fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix 'J' Dimensions.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix 'J' Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).



"Memrex-Exel" switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

All these and many other features.

MEM

WRITE FOR LIST 447 T

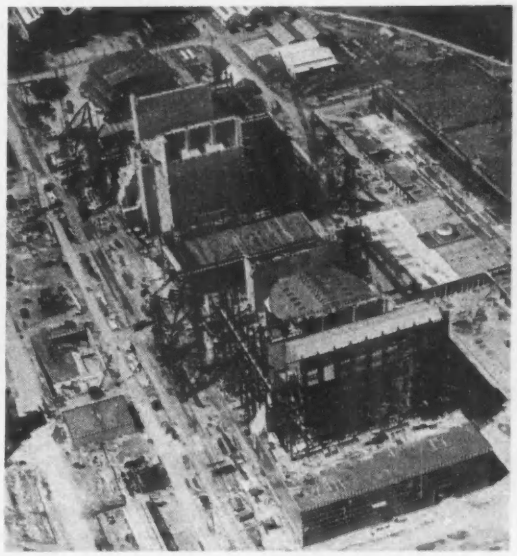
MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY, BIRMINGHAM, 11.

Hydro in Glen Nevis?

THE possibility that the N of S HEB may propose a hydro scheme in Glen Nevis was suggested by Mr I. Duncan Millar, a part-time member of the board, in a speech to the Perth area of the NFU of Scotland. Mr Millar anticipated that such a proposal would be heavily criticised, as would be schemes in Kenmore and Grandtully, Perthshire, also under discussion. He said that if they were turned down by adverse criticisms "potential sources of profit from which the board could finance uneconomic projects would be lost." He added that although the board were making a loss on most farms and smallholdings they were now connecting, they continued to provide these supplies on terms which were exceptionally good bargains for the new consumers.

Hydro Division for E.E.

ALL aspects of the English Electric Company's hydro-electric engineering work are to be combined under a new division centred on Netherton Wks, near Liverpool (as briefly noted last week). From 1 Sept. the new hydro-electric division will be responsible for all commercial, engineering and manufacturing operations connected with hydro-electric installations, including design and manufacture of water turbines and alternators, large valves and other ancillary equipment. Staffs of design, purchasing and mechanical development sections of the water turbine department (at present based on Rugby) will join the existing water turbine alternator section already at the 70 acre Netherton factory. The English Electric hydraulic laboratory will form part of the division, but will remain at Rugby.



At Hinkley Point, progress with the 500 MW nuclear power station being built by the English Electric-Babcock and Wilcox-Taylor Woodrow Atomic Power Group has reached the stage where five of the s.r.u's for No. 1 reactor are in position. The main pressure vessel for No. 2 reactor is in an advanced stage of installation, and fabrication of the s.r.u's. is in progress. To the right of the turbine buildings, main and auxiliary turbo-alternator sets are in course of erection. A temporary roof has protected the charge floor of No. 1 reactor while installation work has proceeded on reactor components

M-R TAKEOVER PROGRESS

SOME simplification was brought to the battle for control of M-R at the end of last week when a joint statement by EMI, Morphy-Richards and Philips Electrical Industries announced that EMI consider an alliance between M-R and Philips to be "not incompatible" with EMI ownership of Morphy-Richards. Earlier it had been confirmed that Philips was negotiating for a trade agreement with Morphy-Richards and had been doing so prior to the original discussions between EMI and Morphy-Richards last May.

When these discussions broke down the negotiations with Philips were resumed. At the time of their recent takeover move the EMI was unaware of the nature and extent of these talks.

Further statements are promised. By the time the joint statement was issued on Thursday night, it was reckoned that EMI had acquired about one-third of the Morphy-Richards capital.

As we go to press, M-R shareholders are expecting to receive the official EMI offer. The M-R board has promised a statement to shareholders after this offer (two EMI 10s units for three M-R units) has been received.

40 MVA Furnace Transformers

TWO furnace transformers for the huge £10 million steel melting plant of Steel, Peech and Tozer at Templeborough are to be built by AEI Transformer Division.

Claimed to be the largest furnace transformers in the world, they will be the first of six to be installed. Each transformer will be rated 40 MVA, with a 33 kV primary winding energised through an auto-wound voltage-regulator with on-load tap changing gear. Resistor transition tap changers will be used, giving a secondary voltage from 565 to 500 V with constant kVA, and from 500 V to 200 V with constant current: in all, a total of 14 steps. An auxiliary 11 kV winding on the main transformer will also have its voltage variable and may be used for subsequent connection of power factor correcting capacitors.

The main and auto-transformers will be mounted in the same tank. A feature of interest is that the interleaved low voltage busbars rated for 46,200 A will be taken to the furnace connections where the delta will be closed.

The plant at Templeborough will be supplied from a 275 kV grid station through four 75 MVA transformers with connections to the furnace circuit-breakers through 750 yd of 33 kV single-core oil-pressure cable.

G.P.O. Orders Outlook

OUTLOOK for orders from the GPO in the telephone field are not encouraging, says Mr G. F. Shipman, chairman of Phoenix Telephone and Electric Holding, who are the subject of a takeover offer by a consortium of seven leading companies in the same field. He says that although there has been a small increase in GPO orders during the year, a really substantial improvement can be expected only over a considerable period of time.

MORE ACQUISITIONS

Switchgear-Electronics

CONTACTOR SWITCHGEAR LTD. have purchased the business of Radio Aids Ltd., of Watford, a company established in 1931, which has been increasingly active in the field of industrial electronics and instrumentation. Contactor Switchgear consider the business of the two companies complementary. Mr E. L. Gardiner is to continue as managing director to Radio Aids Ltd., and Messrs H. Rayner and A. V. Lawry have joined the board of the company.

Brush-Kenton

FOUNDED 20 years ago, the precision engineering firm of Kenton Engineering Co. Ltd., has been acquired at a price in the region of £60,000 by Brush Electrical Engineering Co. Ltd., Loughborough, Leics. Work for the Brush Co. has been carried out at Rothley for some time under sub-contracts. Dr B. L. Goodlet, Mr R. G. Hooker and Mr R. L. Oddie, members of the Brush board of directors, are to be responsible for the management of the business at Rothley, which employs about 30. The founder of the firm, Mr William G. Hackett, retires from the board; his co-director, Mr G. S. Higgs continues as works manager.

Lighting for the new "Windsor Castle," due to sail on her maiden voyage today, includes the cold cathode GEC installation shown. Other electrical firms involved include AEI for engine-room instrumentation and W. H. Allen for auxiliary generators

No Future for Oil from Coal

PRODUCTION of oil from coal is not economic as world markets are today. That is the major conclusion reached by the Committee on Coal Derivatives, appointed by the Minister of Power in April last year. In their report (Cmnd. 1120), they recommend winding-up the Ministry's experiments in this direction when the objectives of the programme on the Fischer-Tropsch process now in hand at the Warren Spring Laboratory have been achieved.

The committee also reports that, unless some new and unforeseen technique is discovered, underground gasification of coal is not an economic process.

Study of coal-to-oil techniques was first initiated at Billingham in 1933 when it was considered that there were prospects of a world shortage of petroleum in the near future. On coal and hydrogen for the hydrogenation process up to 1938, there was evidence that production could be achieved with a small but economic advantage over petrol in price. Since then, coal costs are up by 335%, hydrogen by 300%, with labour and overheads as well, but, excluding duty and tax, petrol is only up by 180%. Production today would be 10½d/gallon above petrol from the pump without taking into consideration distribution and marketing costs.

Other countries are finding the same thing. In America, after spending $87½ million in 11 years, production costs were shown to be 29c per US gallon as against 11·5 to 13·4c for motor fuel from petroleum. The programme was abandoned in 1955. Another plant cost its owners $50 million before it was shut down. In South Africa a plant put up in 1955 and paying 6s/ton for coal is operating currently at a loss of £400,000 per annum. Nevertheless, there is much constructive and useful comment in the report, which indicates a future for the coal-processing industry in several directions, even if it is not in fuel-oil production.

Trentside Worry on Ash

ASH disposal problems arising from the increasing number of power stations being built on the banks of the Trent have led Derbyshire County Council to call on the Ministry of Power to treat the situation nationally. The council is concerned at the considerable distance over which ash has often to be carried before being dumped. The council's planning department has hopes that there will be a meeting between the two Ministries concerned, Power and Housing and Local Government, before long.

Aluminium in Germany

GERMAN aluminium prices were unchanged during 1959, points out the report of a German aluminium company, Vereinigte Aluminium-Werke A-G. They were amongst the lowest in the world. The report goes on to say that North American and Norwegian producers increased their selling prices at the end of the year and in the UK prices rose because of far-reaching dependence on American supplies.

New Rates for Jointers

NEW rates of pay for plumber jointers and their mates have been agreed and will come into effect at the beginning of the first pay period after 21 Aug. Out allowances have been increased by 2s a day to 11s, with excess allowances legitimately and unavoidably incurred over and above the normal. Allowances for working in oil bays is up 1s to 4s a day and the rate for jointers engaged on jointing cables at 33 kV and above is increased by 1d/hr. A new clause on overtime worked after midnight grants the jointer leave with pay on the day after, providing that it is a normal working day with, in addition, extra pay at normal rates for any hours, after working through the night, which overlap the normal working hours of the second day. The announcement has been made by the Joint Industrial Council for the Electrical Cable Making Industry following a meeting of the Standing Joint Committee on Plumber Jointers held on 9 Aug.

H.P. Register of Bad Debts

UNSATISFACTORY hire-purchase and credit customers will be named in a register to be started by Hire Purchase Trade Association, it was announced last week. Initially this will cover a wide area around Greater London and the Home Counties, but steps are to be taken to extend the system on a nation-wide basis. The association claims that the new register will benefit both the trade and the public.

Although this step has been taken, bad debts are said to remain at about one-half of 1% of the business done. However, it will be recalled that the Prison Commissioners in their recent report drew attention to the increase in number of h.p. debtors now in prison.

Joint Committee for Stress Analysis

REPRESENTATIVES appointed by the IEE are amongst members of a Joint British Committee for Stress Analysis formed to represent the UK at periodic meetings of an international organisation concerned with the subject. The committee has been set up following an exploratory meeting organised by the Institute of Physics last March. Its objectives will be to act in the collective interest of the constituent bodies in the following ways:

(a) by maintaining liaison with the Permanent Committee for European or international conferences on stress analysis, and

(b) by maintaining liaison with overseas societies and institutions concerned with stress analysis.

First chairman of the committee is Mr A. F. C. Brown, of the NPL, who represents the I.Mech.E. on the committee. Other bodies represented are the Royal Aeronautical Society, ICE, I.Mar.E., Royal Institute of Naval Architects, Institute of Physics and Physical Society, Institution of Structural Engineers and Institute of Welding. Secretariat for the Committee is to be provided by the Institution of Mechanical Engineers.

OFFICIAL PUBLICATIONS

Research for Industry, 1959. Report of DSIR Industrial Grants Committee. HMSO, price 8s (see page 234).

Command Paper 1120. Report of the Committee on Coal Derivatives. HMSO, price 4s (see this page).

Report of HM Chief Inspector of Mines and Quarries, 1959. HMSO, price 4s (see page 247).

SI, 1960, No. 1296. Export of Goods (Control) Order, 1960. HMSO, price 1s 3d (see page 258).

Why Japanese Scientists leave home

MUCH is heard of the effect of low wages in Japan in keeping down the prices of her exports. The other side of the coin was examined in a recent magazine article in Japan. This voiced concern at the loss of scientists to Europe and the USA because of comparatively low payments to university staffs in Japan. Reported rates for a professor ranged from average £560 p.a. to a maximum of £816 p.a., while an assistant professor received an average of £420 p.a.

Lower-Price CR Tubes?

AN announcement is expected today about the plans of a new British company outside the British Valve Manufacturers' Association, to manufacture and market cathode ray tubes at prices significantly below those generally ruling at present. The announcement is being timed in relation to the forthcoming Radio Show, which opens on 23 Aug.

London-Midland Electrification behind programme

ELECTRIFICATION of the main line between Euston, Manchester and Liverpool, originally planned for completion by 1968, but earlier this year put forward to 1964, may not, after all, be ready by then. Delays are mainly in civil engineering work for which both skilled and unskilled labour is in short supply in the Midlands.

Equipment contractors, too, are feeling the labour shortage and, in particular, locomotive deliveries are behind. As a result, a fresh reappraisal of the programme is to be made at the end of the year and, though there is still hope of reaching completion by 1964, optimism is not so high.

The London Midland Region electric traction engineer, Mr K. Taylor, told a press conference last week that the introduction of the electric service between Manchester and Crewe on 12 Sept. would not, at first, affect present diesel and steam train timings but the service would be improved later.

Eventually, though, express electric trains would cover the distance between Manchester and Crewe in 18 min less than at present.

Road safety research in Europe

LIGHTING and lamp standards are likely to be amongst subjects of interest to a new international body for fostering road safety research. A decision to recommend OEEC countries to set up such an organisation was taken at a four-day international meeting at DSIR's Road Research Laboratory. The new organisation would co-ordinate research in this field, foster the interchange of information and recommend new researches on problems whose solution requires or would profit from international co-operation.

Fraud or No Fraud?

IS it a fraud to consume electricity by reconnecting the electricity supply meter after it has been disconnected, usually for non-payment of accounts? Last week we reported a case in the Southern Board's area where it was held that no fraud had been committed since the electrical energy used would have been metered, the consumer was found guilty of laying wires to the electricity mains only. Now comes a report from Newcastle upon Tyne of a man fined £5 for unlawfully using electricity. The defendent's supply had been cut off for failing to pay the electricity account. It was found that supply had been restored by bridging the main fuses with lighting flex. For the North Eastern Electricity Board, Mr R. W. Doncaster said that offences of this kind had recently increased tenfold and the board were more concerned with the danger to life than the amount of electricity stolen in this way.

At Plymouth, magistrates jailed for one month a man who had reconnected his supply by placing copper wire across the terminals of the main fuse holder. Evidence was given that electricity worth £21 17s had been used. From reports it seems that the accused pleaded guilty.

In a Southern EB case, a man who pleaded guilty to inserting a fuse to reconnect his disconnected supply was fined £5 for fraudulently consuming electricity.

Local Radio: First Steps

ALTHOUGH it will not be known until 1962 or, perhaps, 1963 whether low power local radio stations will be permitted in this country, the Rank Organisation and other enterprising business groups have been taking the first step on the path to local stations by setting up private companies. Rank's have registered 29 companies, each of £100 nominal capital, with the objects of "construct, erect, provide, equip and operate stations, studios and other premises for sound and television broadcasting purposes and to act as engineers, contractors, technical and commercial consultants in connection with any such activities." There were at least 21 other registrations of a similar nature last week, the majority being organisations with newspaper connections.

Selecting glasses is a thoughtful business in these fashion-conscious days. To provide the right atmosphere at a Norwich optician's, Thorn have supplied two continuous lines of Domino fittings, with the display racks highlighted by l.v. spotlights mounted above the spines of the main fittings. Next to the wall, daylight reflector tubes throw a subdued light on to curtains

More Power for Douglas

DOUGLAS Town Council are being recommended to extend their Pulrose power station by installation of a 2,200 kW diesel generator. Estimated cost of the extension, for which the earliest commissioning date is estimated as March, 1962, would be £76,500.

NEW PREMISES

SEVERAL firms have announced factory extensions in the past week. Amongst them is the Drayton Regulator and Instrument Co., who have taken 55,000 sq ft of factory space near their main offices and works. They say this will give much needed room for their continued expansion. The factory taken over is that of Johnson Wax concern. Advance Components Ltd., the electronic instrument firm, have begun an extension of their Hainault, Essex, factory planned some time ago. The building now under way will increase production area by half and office accommodation by one-quarter. Another firm going to larger premises is George Wimpey and Co., who have acquired a 12-storey office block, Flyover Hse, on the Great West Rd. This is to house staff of 550 engaged on design and development work.

Irish dislike saving

ALMOST complete lack of support for a savings box scheme introduced some time ago by the Eire Electricity Supply Board has led to the scheme's withdrawal. The board had offered savings boxes to consumers on payment of 5s, the ESB retaining the key and opening the boxes when accounts were presented for payment. Withdrawal of the scheme is said to be no more than recognition of the fact that it has been dead for some time.

Export Licensing Changes

CHANGES in export control consequent on amendments to list of goods embargo for the Soviet bloc and China are to come into operation from 22 August. They include removal of control from magnesium oxide and reduced control on a number of goods including refractory goods, nickel alloys and germanium. Silicon is to be controlled only in terms of export to other than Commonwealth countries, Eire and USA.

Export control is imposed to countries other than these for certain electronic assemblies and electric vacuum amongst devices. The descriptions of goods to which export control applies have been amended in some cases, including diodes, electric impulse generators, wave guides and components, electronic precision instruments, transistors and recording devices, printed circuit equipment and valve manufacturing and testing equipment. The changes are dealt with in the Export of Goods (Control) Order, 1960 (SI, 1960, No. 1296).

PYE'S PRIVATE RADIO SHOW

INSTEAD of exhibiting at the Radio Show later this month, Pye Ltd. are organising a television, radio and electronics exhibition at the Royal Festival Hall on 22, 23 and 24 Aug. The firm considers the Radio Show offers limited scope at Earls Court, and prohibits a sufficiently comprehensive display of their diverse activities. Amongst plans for the exhibition are fully operational television studio and control rooms on view through glass walls, and a local radio station, such as has been suggested for the revised arrangements for broadcasting in the UK. Electronic instruments will also be on show.

As an additional attraction, Pye's have taken the entire Festival Hall seating for the three nights to cover special performances by the Royal Festival Ballet, and tickets for these performances are to be available to the Pye group's guests.

N.I.C. lag in M.A.N.W.E.B

THE area of the Merseyside and North Wales EB is a black spot so far as the NICEIC is concerned. Brigadier W. S. Thompson, chief executive officer and secretary of the Council, told the MANWEB Electricity Consultative Council this last week. At 220 enrolled contractors (counting the board as one) the density is lower than for most other areas; and wastage has exceeded recruitment. Brigadier Thompson, answering questions about the Council's activities, said that the ultimate answer to the work of the handyman was publicity about its dangers. Later in the meeting the Consultative Council members drew attention to trouble with floor-warming caused by faulty switching arrangements, so that controls for one room operate floor-warming in other rooms. This point is to be dealt with at the next (October) meeting of the Consultative Council.

Closed Circuit TV at Harwell

CLOSED circuit television has been incorporated in the high power materials testing nuclear reactors PLUTO and DIDO. Pye equipment has been installed at Harwell to enable the inside of the reactor buildings to be viewed from an external control position should evacuation of them ever prove necessary because of accidental release of radioactive materials. In everyday conditions the television installation will be used to enable the control room staff to view and co-ordinate any special work in progress on the reactor top, which is not possible from the control room. Field-of-view selection, focusing and lens changing are all remotely controllable by an operator from the emergency control or the normal control room.

IN-OUT FREQUENCY

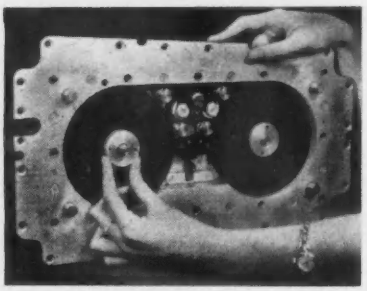
ELECTRONIC equipment can tackle most problems. The latest development of Joseph Lucas Ltd. is a "stroke meter" designed to measure the instantaneous stroke rate of a rowing eight. It can replace the usual method of the cox counting strokes against a stop watch and has been made to meet a request by the Oxford crew which is to represent Britain at the Olympic Games. The device consists of a photo-cell mounted in the boat under the sliding seats and clocks the number of times the cell is exposed to the light as the oarsman comes forward on a stroke. The stroke rate is given on a meter visible to the cox. The device is transistorised, light in weight, and operated from a dry cell.

Iron and Steel Engineers to Meet

A PAPER on lighting in the iron and steel industry will be amongst those presented to the forty-first meeting of the Iron and Steel Engineers' Group of the Iron and Steel Institute, to be held in Scunthorpe from 24 to 27 Oct. Other papers will deal with general engineering problems at Appleby-Frodingham over the last six years, and investigation of failures in blooming mills. A programme of visits has been arranged as part of the meeting.

LATEST ORDERS: HOME and ABROAD

TURBO-ALTERNATOR blocks for the first 550 MW set at Thorpe Marsh are to be constructed by the Mitchell Construction Company, in a £220,000 contract awarded by the CEGB. Another Thorpe Marsh contract announced is for the supply of two Allen-Stoeckicht epicylic gear units for the motor-driven boiler feed pumps at the station. These units have been ordered from W. H. Allen Sons and Co. by G. and J. Weir Ltd. and are designed to transmit 8,200 h.p. continuously, stepping up the motor speed from 990 r.p.m. to the pump speed of 4,500 r.p.m.



This steel-cased miniature tape recorder is designed to survive aircraft crashes. Only 13 in. long by 6 in. by 6 in., it is being marketed by Armstrong Whitworth, following development by missile electronic engineers. Already it has survived many impacts with the Australian desert in Woomera rocket range tests. In these, not only has the tape been recovered, but in 90% of cases the transistorised and encapsulated electronic circuitry has been salvaged successfully. Eight-track tape can be used with the recorder

LATEST order for Ferranti's Orion data processing system is from the Norwich Union, one of Britain's largest life insurance offices. This is to be used initially in connection with the pension scheme business of the society. A complete record of each pension scheme and individual policy will be held on magnetic tape.

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THREE 5 kW vision transmitters and associated 1 kW sound transmitters for the pilot television service to be operated by the New Zealand Broadcasting Service have been ordered from Marconi Wireless Telegraph Co. The value of the order is over £100,000.

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A CONTRACT for two hydro turbines has been won by English Electric Co. in USA. The set will be used in connection with California reclamation schemes. The authority making the awards said it had been decided not to give more than one contract to each foreign firm (the Hitachi Co., of Japan, was also successful), because these had not yet had an opportunity to show what they could do. The turbines will be of special design, having two interchangeable runners. These will suit heads of 426 ft and 334 ft, to match seasonal changes in water level.

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MURPHY RADIO have been awarded a £1 million contract for an extensive v.h.f. radio network in the Himalayan foothills.

NO GAS FOR DUNDEE

THE Dundee Town Council have been informed that the town gasworks may have to close through falling demand. In recent years, three out of four new houses have been all-electric and the housing committee proposes to make the 3,400 houses on the new Menzieshill estate, in the city's first smokeless zone, all-electric as well. In addition, street lighting has also been turned over from gas to electricity.

As a result, gas production costs are high in Dundee; economies can be effected by shutting the works and taking gas in bulk from Fife. Mr W. N. Baird, manager of the Scottish Gas Board's central division, has appealed to the council to give tenants of corporation houses freedom of choice between gas and electricity.

Bad Factory Wiring Condemned

THE presence of exposed electric wires and dangerous electric switches were amongst offences alleged in a Factory Department prosecution of a Herne Hill, London, manufacturer of standard lamps. A factory inspector giving evidence said he found 15 amp fuses with eight or ten turns of wire on them. For the defendant, it was stated that these offences and others against the Factory Acts had been committed when the factory was shortly to be closed for removal to new premises. The new factory is now in use.

Mobile Exhibition

TWO special caravans supplemented by two Land-Rovers house a mobile exhibition organised by Parmiter, Hope and Sugden to show their Aeroflex fuses and Fluvent fusegear. The initial tour for the exhibition is in the North and Midlands.

Sayings OF THE WEEK

"Leaving aside fundamental research, it is wasteful to proceed with either applied research or large scale development without a clear idea of the objective and of the likely rewards of success." . . . Report of Committee on Coal Derivatives.

"There are about 200 kinds of measurements which are industrially important, and detecting instruments can be made for all of them." . . . DR. J. THOMSON, Director of British Scientific Instrument Research Association.

"In one day (24 hours) the amount of energy reaching our outer atmosphere . . . exceeds all the energy used by mankind throughout history." . . . MR C. A. ESCOFFERY, of International Rectifier Corporation, talking on solar energy.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, August 16

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	242½	−8½
,, (3 months)	242	−5½
LEAD, refined pig, 99·97% purity (cash)	71½	+1
,, (3 months)	71½	+½
TIN, refined, min. 99·75% purity (settlement)	796½	−10
(3 months)	798½	−9
ALUMINIUM, ingots 99-99·5% ...	186	—
,, wire bars (4 × 4 × 54")	193½	—
BRASS Strip 63/37	218½	—
SILVER (Troy oz)	79¼d	—
ZINC, virgin, min. 98% purity (cash)	87½	−1½
,, (3 months)	88½	−1½
RUBBER, per lb.		
No. 1, R.S.S. spot	29⅜d	−⅛d
c.i.f. basis, ports, Oct.	29⅜d	−1⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1⅛ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	33c	—
Lead (New York)	12c	—

* *Tape Price, now on average, includes varnishing*

Airport Lighting in Mauritius

EXTENSIVE lighting installations for Plaisance Airport, Mauritius, are the subject of a £25,000 order received by GEC. The airport is a staging point for flights in the Indian Ocean, and timings of these are such that many arrivals and also most take-offs are in the dark or early morning. Low intensity lights will be provided for the 6,600 ft long runway and there will be a 1,400 ft long approach lighting system.

Three stages of brightness control will be provided for all low intensity runway and approach lighting and five stages for high intensity lighting, which includes visual glide path indicators. All airfield lighting will be controlled remotely from the control tower, for which the GEC is also supplying two standby diesel alternator sets. There is to be a general revision of supply and distribution arrangements for the airport buildings and this is also included in the contract GEC have received.

Quality Control Conference

AN international conference on quality control, arranged by the British Productivity Council, will take place at Church Hse, Westminster, S.W.1, from 1 to 3 Sept. next. Eleven papers are to be presented by specialists from Britain, USA, Germany, Holland, France, Belgium and Italy.

The conference will be opened by Mr Frederick Erroll, Minister of State, Board of Trade. Theme of the conference is "Controlling Product Quality—Its Value to Industry."

Overhead line permit refused

£300 extra to underground an electricity supply to a sports ground is worth spending to preserve Green Belt amenities. That was the conclusion of an MoP inspector who conducted an inquiry into a Seeboard proposal for an o.h. line to a Claygate, Surrey, sports pavilion. It has been upheld by the Minister of Power despite the board's argument that for the most part the line will be screened by trees and hedges.

Selling Capital Goods

A CONFERENCE on "Selling Capital Goods," arranged by the British Institute of Management, will be held in Harrogate from 16 to 18 Nov. Papers to be presented will discuss the export of capital goods to under-developed countries, the effect of the Common Market on exports, overseas sales and service, production techniques, etc.

Right of Day Release

REPRESENTATIVES of employers, trade unions and local education authorities are to meet with the Minister of Education in the autumn to discuss compulsory day release. This follows suggestions that boys and girls under 18 should be given the right to claim day release from their jobs for the purpose of following courses of further education.

News in Brief

Handicapped people often find light switches too low and socket-outlets also. This point was made by an occupational therapist at a recent meeting at the National Federation of Housing Societies. She contested the claim that if a house were designed for handicapped people, others would find it inconvenient.

Fire brigade pumps were used to maintain flow of cooling water at Fleetwood power station recently when an inlet valve from the dock installation failed.

Turner Bros. Asbestos Co. are introducing an organised apprentice scheme for commercial trainees. It will cover five years from recruitment at a minimum GCE Ordinary level.

Company Activities

BACK come the buyers! President Eisenhower's: "There ain't gonna be no slump"—or words to that effect—the cut by ½% to 3% in the "Bank Rate" by a number of the US Reserve Banks, combined on this side of the Atlantic with talk of an early reduction in our own Bank Rate, Mr Macmillan's peace "pow-wow" with Dr Adenauer aimed at linking the "Six" with the "Seven," and the simple facts of accumulated investment monies and a share shortage in London, all contrived to lift the F.T. industrial ordinary share index last week from 315·8 to 329·4. Thus, it now stands only some 3·9% below its 1960 "high" of early January. Investors, however, would be well advised to step carefully in their choice of shares, not to rush in haphazardly; for the economy still has several high hurdles to negotiate and not least the problem of our export/import unbalance. It would take only a minimum of adverse economic news to reverse the present buoyant trend in stock market dealing.

As was only to be expected against such a cheerful background, electrical shares were particularly bright. Gains extended well into the "heavy" list so that AEI finished the week 1s 1½d dearer at 51s 6d, while English Electric advanced from 39s 1½d to 40s 9d and GEC put on 3s 6d to 38s 9d. C. A. Parsons were wanted at around 52s 6d, representing a rise of 2s 6d on the week while "twin" Reyrolle went 2s 6d better to 41s 6d. Chloride Electrical Storage Co., who make the "Exide" batteries, saw their £1 "A" Ordinary jump 1s 7½d to 79s, while J. F. Stone, despite the harder times for radio, TV and domestic appliance dealers, experienced a puzzling leap from 25s to 30s. Plessey, on talk of a quote in the not too distant future on the Paris Bourse, rocketed a more understandable 5s 3d to 55s 9d and, despite denials of takeover, E. K. Cole were still being bought at 22s 3d, against 19s 6d earlier in the week.

But, of course, it was the EMI-Morphy-Richards affair that continued to be the centrepiece in the mild firework display put on last week by the electrical share market. Additional drama was supplied when it became known that Philips Lamps and M-R had secretly been exploring the possibility of an agreement to cover joint research, development, design, production and distribution. EMI, bidding two of their 10s Ordinary shares for every three 4s Ordinary in M-R, objected, threatening legal action, but after a huddle between the representatives of the three companies, all came out of the conference room more or less smiling with news that an understanding had been reached. All this was naturally accompanied by a big turnover in the shares of those concerned, so that Philips after opening the week at 11¼ closed the week at 12 11/32. EMI, opening at 47s 3d, went later in the week to 45s 3d before recovering to 47s 9d. Those who last week took my counsel to "sit tight" on their Morphy-Richard shares when they were then 30s 4d, later had the opportunity of selling in the market at 33s 1½d, after the shares had risen in the course of a single day's trading by 4s 1½d on heavy buying, believed to be by EMI, who now hold well over 30% of the M-R equity. Now back to around 31s the EMI bid still values the shares at 31s 10d against their 1960 "low" of 16s 2¼d. —*From our City Correspondent.*

Britannia Electric Lamp Works Ltd.

With little change in the level of profit, £25,117 against £24,321 last year, after tax profit amounts to £20,911 (*£20,224*). The dividend is maintained at 12½% for the year.

Christy Bros.

For the year to 31 March, group profit fell to £26,750 from the previous year's total of £35,349 after tax being paid of £22,944 (*£35,487*). None the less, the year's dividend is maintained at the same, 8%. £12,000 is added to the general reserve of a subsidiary and £48,333 carried forward.

Dorman Smith Holdings

The preliminary figures show a substantial rise in the results of the year to 31 March. The consolidated net profit is reported as £184,718, compared with £100,531 last year, before tax of £89,536 (*£50,005*).

Hick, Hargreaves and Co. Ltd.

With revenue reserves totalling £1,947,482 the balance sheet shows a strong position said the chairman at the a.g.m. The volume of trade has been well maintained partly due to the development of a new hydraulic air pump designed for large power station units. The order book now stands at £6 million and includes feedheating and condensing plant for the 550 MW Thorpe Marsh sets. He considers the situation satisfactory and with no untoward difficulties the results for the current year should be equally satisfactory.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1956	700,649	289,579	66·6	18½‡	85/6	65/-
1957	732,600	272,995	62·8	18½	90/-	67/6
1958	1,030,999*	384,344*†	78·5	20‡	69/3	43/-
1959	832,560	328,822	42·3	16	85/-	67/6
1960	938,189	368,991†	47·1	18	87/6	55/7

* Includes 18 months subsidiary accounts. † After deducting pre-merger profits 1958: £51,958; 1960: £6,436. ‡ Plus 50% capital.

Keith Blackman Ltd.

A reduction of £117,586 in the consolidated group profit, making £218,277 for the year to 31 March is reported. The reduction is attributed to lower margins and the value of orders received exceeded that of the previous year with a marked improvement in the closing months. The profit after tax was £122,410 (£134,984), but despite the reduction the dividend was held at 17½%.

George Kent Ltd.

With a 35% jump in profit, from £278,586 last year to £381,742, the dividend is maintained at 17% for the year on a capital increased by a three-for-eight rights issue. It is now proposed to make a one-for-one scrip issue.

Nigerian E.S. Corporation Ltd.

As reported briefly last week, a special dividend equalisation distribution of 4% is being made in addition to a final of 6% making in all 14% (8%) for the year. Net profit was £102,748 (£46,972) and after depreciation £47,314 (£41,845).

Thorn Electrical Industries Ltd.

With an increase of £570,000 in the group net profit, Mr Jules Thorn had a good story to tell shareholders; the trading profit was nearly £4 million. The accounts show a capital profit of £1,336,000 on the sale of a half interest in an h.p. finance company and includes £321,000 for investment allowances. The reason for the announcement of a scrip issue is seen in the figure for reserves which total £8,765,000.

In the fluorescent tube field, Mr Thorn was optimistic and despite the claim that they still make more tubes than all other UK manufacturers, they are planning for substantial increases in sales. Incandescent lamp business, however, continues to be highly competitive. The Atlas Popular Pack is selling well and in the next few weeks they hope to reach the second million mark. In the radio and television field a reduced demand is expected during the year, but Tricity Cookers are expected to make an important contribution to the profit of the parent company. The built-in cooker is in quantity production and the first Tricity refrigerator has been introduced. In the export field, lighting sales have considerably expanded and overseas companies are doing well. A stake in Europe is available not only through the German subsidiary, but a major interest in an Italian company has been acquired.

Year to 31 Mar.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1956	1,736,788	537,658	57	15	22/6	14/11
1957	2,121,249	592,637	63	17½	27/3	16/3
1958	2,343,238	643,454	67	17½	28/3	19/9
1959	2,953,536	932,474	91	20	57/3	26/3
1960	3,916,990	1,475,110	109*	25	55/9	43/-

* On increased capital

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

18 Aug.—Cookstown. Electrical installation in hostel and extension at Loughry Agricultural for M. of Finance.—See 21 July issue.

18 Aug.—Plymouth C.C. Lighting installation improvements, by registered contractors, at City Abattoir, Prince Rock.—See 11 Aug. issue.

18 Aug.—Sittingbourne and Milton U.D.C. Supply and/or erection of 112 Group "B" and eight Group "A" concrete columns with 80 and 250 W m.v. lighting.—See 4 Aug. issue.

19 Aug.—Belfast. Electrical installation in meals kitchen at Christian Brothers' Voluntary Secondary Intermediate School For Boys, Glen Rd.—See 11 Aug. issue.

19 Aug.—Coquet Water Board. Lighting, heating and power installations at new filtration works and pumping station at Warkworth.—See 4 Aug. issue.

19 Aug.—Down C.C. Supply and installation of lift at St. Leonard's Rehabilitation Centre, Warrenpoint.—See 11 Aug. issue.

19 Aug.—Dunfermline T.C. Electrical work separate trades tender in erection of 27 cottages/flats at Park Rd West, Rosyth.—See 11 Aug. issue.

19 Aug.—Manchester C.C. Electrical installation in workshop at Heaton Park.—See 4 Aug. issue.

19 Aug.—Withernsea U.D.C. Supply and erection of 63 15 ft concrete columns and 65 60 W sodium lamps, lanterns and control gear. Surveyor, Municipal Bldgs, 243 Queen St.

20 Aug.—Bournemouth C.B. Provision and erection of two 260 kW dual fuel alternator sets and associated switchgear for contract 3, Holdenhurst Sewage Disposal Works.—See 28 July issue.

20 Aug.—Dunbarton C.C. Provision, erection and wiring of 126 lighting columns in Vale of Leven and Renton Special Lighting District.—See 11 Aug. issue.

20 Aug.—Hawick. Renewal of electrical installation at Cottage Hospital. Applications to Group Secretary and Treasurer, Borders Hospitals Board, Newstead, Melrose, by above date.

20 Aug.—Inverness C.C. Heating and electrical work in new County Buildings.—See 11 Aug. issue.

20 Aug.—North Shields. Rewiring of two wards at Preston Hospital.—See 21 July issue.

22 Aug.—Armagh C.C. Supply of electrical equipment for school meals service.—See 11 Aug. issue.

22 Aug.—Basildon U.D.C. Supply and erection of: (a) 16 concrete columns A13 High Rd, Bowers Gifford; (b) 35 steel columns A129 London Rd, Billericay; (c) 70 steel columns A129 Southend Rd, Billericay, all with sodium lighting. Engineer and Surveyor, 88 Town Sq.

22 Aug.—Castlederg R.D.C. Supply and erection of 79 fluorescent lanterns, etc.—See 28 July issue.

22 Aug.—Chelmsford. Subcontract 16. Provision and installation of cables, external lighting, heating and lighting of buildings, power distribution and control equipment for extension 2 at Brookend Sewage Disposal Works.—Advertised 21 July issue.

22 Aug.—Dunbarton C.C. Supply of Class "B" fluorescent lanterns to be mounted on 15 ft steel columns for Cumbernauld New Town Special Lighting District.—Advertised 11 Aug. issue.

22 Aug.—Ellesmere Port B.C. Provision and erection of 58 Group "A" columns, taking down 34 Group "B" columns and re-erection.—See 28 July issue.

22 Aug.—Enfield B.C. Section A: Supply of 316 140 W and 181 60 W integral jacketed sodium lamps, lanterns and gear. Section B: Supply of 316 25 ft and 181 15 ft concrete columns. Section C: Erection of columns/brackets/lanterns and removal of existing columns.—See 28 July issue.

22 Aug.—Frimley and Camberley U.D.C. Supply of 150 Group "A" steel columns.—Advertised 4 Aug. issue.

22 Aug.—Hendon B.C. Supply of (Item 6) electrical fittings for period to 30 Sept., 1961.—See 11 Aug. issue.

22 Aug.—N.I. Hospitals Authority. Supply of (ii) electrical accessories for nurses' home.—See 11 Aug. issue.

22 Aug.—Sunderland C.B. Electrical installation in Central Library and Museum extensions/alterations.—See 11 Aug. issue.

23 Aug.—West Lothian C.C. (g) Electrical work separate trades tender in erection of 131 houses at Hardhill, Armadale. Applications to County Clerk, John Calder, County Bldgs, Linlithgow, by above date.

24 Aug.—Bridge-Blean R.D.C. Supply of duplicate 75 g.p.m. against a 105 ft head vertical spindle direct coupled centrifugal sewage pumps for Tyler Hill scheme.—See 14 July issue.

24 Aug.—Longbenton U.D.C. Supply and erection of Group 1 gas street lighting conversion, 133 sodium vapour units along main road and 24 100 W filament lamps along other roads.—See 11 Aug. issue.

24 Aug.—Manchester C.C. Electrical installation in Sports Pavilion, Hough End Playing Fields. City Architect, P.O. Box 488, Town Hall.

25 Aug.—Cardiff C.C. Electrical installation on fixed price basis by contractor on N.I.C.E.I.C. Roll in "Bryn-y-Don," Approved School, Dinas Powis.—See 11 Aug. issue.

25 Aug.—Shannon Airport. Provision of electrical services in new freight terminal buildings.—See 11 Aug. issue.

26 Aug.—Maidstone B.C. Supply and erection of 1, 2 and two of 4 m.g.d. effluent recirculation pumps together with humus and top water pumps, pressure effluent pumps, motors, control gear, pipework and valves at Aylesford Sewage Disposal Works extension, contract M.11. Applications to consulting engineers: Howard Humphreys and Sons, Victoria Station Hse, Victoria St, S.W.1, by above date. Deposit £5 5s.

27 Aug.—Cork C.C. Supply and erection of 300 g.p.m. centrifugal pumps and motors for Allow Regional Water Supply Scheme.—See 11 Aug. issue.

27 Aug.—Staveley U.D.C. Supply and erection of 56 concrete columns, sodium lanterns, auxiliary gear and cable laying on A619, Worksop Rd.—Advertised 4 Aug. issue.

29 Aug.—Colwyn Bay B.C. Provision and erection of five Class "A" concrete columns with lanterns, control gear, etc., for A55 Section 6 lighting. Borough Engineer and Surveyor, H. Wilman, Whalley Range, Lansdowne Rd.—Advertised in this issue.

29 Aug.—Hoyland Nether U.D.C. Electrical installations in 20 four-bedroom and 180 three-bedroom existing houses Coronation Rd site, Hoyland. Engineer and Surveyor, Town Hall, Hoyland.

29 Aug.—Isle of Ely C.C. Supply of (Part E) electrical equipment for Junior Training Centre for Subnormal Children at Wisbech. Clerk, R. F. G. Thurlow, County Hall, March.

29 Aug.—Llanelly B.C. Installation of communal television aerial for 44 dwellings, Western Works. Borough Architect, 5 Goring Rd.

29 Aug.—Soke of Peterborough C.C. Lighting and power installation by contractors on N.I.C.E.I.C. Roll or E.C.A. members in 36-bed Home for the Aged, Alderman's Drive. Details from architects, Warwick and Ellis, 43a Priestgate, Peterborough. Deposit £2 2s made payable to C.C.

29 Aug.—Whickham U.D.C. Provision of street lighting along Dunston Rd C.118; Wellington Rd and Gasworks Bridge Rd C.118; and Ravensworth Rd, Dunston. Council Clerk, J. Buggle, Council Offices, Whickham, Newcastle on Tyne.

31 Aug.—Breconshire C.C. Electrical installation by contractors on N.I.C.E.I.C. Roll or E.C.A. members in new council chamber.—See 11 Aug. issue.

31 Aug.—East Barnet U.D.C. Contract 927. (a) (i) Supply and erection of 87 25 ft and 62 15 ft concrete columns/brackets and of 12 15 ft c.i. columns/brackets; (a) (ii) resiting of 160 15 ft metal and 25 15 ft concrete columns/brackets; (b) supply and fitting of 87 140 W, 220 60 W and fitting only of 66 60 W sodium vapour lanterns; (c) wiring. Engineer and Surveyor, Town

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 108 queries answered this week

"Kilfrost" de-icing compounds—makers of? T.B.—Kilfrost Ltd., 20 Saville Row, Newcastle-on-Tyne 1.

"Electramaid" floor polishers—repairers of? E.E.—Bylock Electric Ltd., Cartersfield Rd, Waltham Abbey, Essex.

"Rayway" dental equipment—makers of? C.E.—Norman Rayne Ltd., 116 Bayham St, N.W.1.

"Norge" washing machines—address for? H.E.—Kenwood Manufacturing Co. Ltd., Hipley St, Old Woking, Surrey.

"Calor" extractor fans—suppliers of? E.E.—S. I. Engel and Co., 23 Kensington Park Rd, W.11.

"Progress" floor scrubbing machine—address for? E.E.B.—Progress (Universal) Ltd., 590-594 Wandsworth Rd, S.W.8.

"Beatty" washing machines—agents for? M.A.N.W.E.B.—Beatty Bros. (Tenbury) Ltd., Station Bldgs, Stamford New Rd, Altrincham, Cheshire.

"Siroma" hairdriers—makers of? S.M.S.—Siroma Eng. Co. Ltd., North Acton Rd, Harlesden, N.W.10.

"Husquavana" appliances—agents for? T.E.—Condrup Ltd., 67 Worship St, E.C.2.

Hall, Station Rd, New Barnet. Deposit £2 2s.

31 Aug.—Leighton Buzzard U.D.C. Maintenance of street lighting system.—See 11 Aug. issue.

31 Aug.—Manchester C.C. Contract 242E electrical installations in 15 houses and flats at Langley. Director of Housing, Town Hall, Manchester 2.

31 Aug.—Newcastle-on-Tyne C.C. Supply and installation of two automatic lifts in each of seven 13-storey blocks of flats at Pottery Bank and Scotswood Rd.—See 11 Aug. issue.

31 Aug.—Renfrew T.C. Erection of alternative (a) 3 x 80 W fluorescent and (b) 400 W mercury schemes for A8 Inchinnan Rd street lighting improvements—See 21 July issue.

31 Aug.—Saltburn and Marske U.D.C. Electrical installations in 42 houses on Marske La site. Surveyor, Council Offices, Skelton-in-Cleveland.

31 Aug.—Wilton B.C. Installation of street lighting at Bulbridge Private Development Estate.—See 28 July issue.

1 Sept.—Dundee T.C. Supply and erection of multi-stage centrifugal pumps, accessories and switchgear for Menzieshill Pump Hse.—See 21 July issue.

1 Sept.—Farnborough U.D.C. Installation of 218 power points in 48 dwellings on Knellwood estate.—See 4 Aug. issue.

1 Sept.—Kirkby-in-Ashfield U.D.C. Supply and installation of two 20 c.f.m. and one 35 c.f.m. sewage pumps and one 35 c.f.m. sludge pump complete with starters, switchgear, cables, etc.—See 28 July issue.

1 Sept.—Warrington R.D.C. Installation of 48 Class "B" street lighting units on A574, Warrington Rd, Risley.—See 21 July issue.

1 Sept.—Westmeath C.C. Supply and erection of two 9,000 g.p.h. centrifugal pumps/motors for Moate water supply scheme. Details from consulting engineers. P. H. McCarthy and Son, 26 Lower Leeson St, Dublin. Deposit £5.

2 Sept.—Dublin C.B. Supply of 200 street lighting lanterns.—See 11 Aug. issue.

2 Sept.—Maidenhead B.C. Erection of 26 15 ft and two 25 ft reinforced concrete columns and fixing fluorescent lanterns/gear and all incidental works. Borough Engineer and Surveyor, 14 Crawford Rise. Deposit £2.

2 Sept.—Rothwell U.D.C. Provision and erection of 73 140 W sodium units with concrete columns along Leeds-Exeter Trunk Road, A61.—See 11 Aug. issue.

3 Sept.—Cambridge C.C. Supply of (Item d) lamps.—See 14 July issue.

3 Sept.—Irlam U.D.C. Supply and erection of three pumps, any two of which should deal with 350 cu ft per min at 36 ft head of unscreened sewage.—See 11 Aug. issue.

5 Sept.—Manchester C.C. Supply and erection of lighting equipment/auxiliary services for primary sludge digestion plant.—Advertised 4 Aug. issue.

6 Sept.—Dartford B.C. Supply and erection of 91 Group "A" 400 W MBF/U lamps/lanterns on 25 ft reinforced concrete columns for town centre approach roads.—See 11 Aug. issue.

6 Sept.—Lisburn U.D.C. Supply and erection of fluorescent street lighting equipments for improved lighting to Group "B" or Intermediate standards.—See 11 Aug. issue.

6 Sept.—Manchester C.C. Supply of street lighting equipment for year from 1 Jan., 1961, comprising: cable, concrete and columns, flashing beacon globes, road sign fluorescent fittings, globes, lanterns, time switches and traffic bollards. City Surveyor, Town Hall, Manchester 2.—Advertised in this issue.

7 Sept.—Cheadle and Gatley U.D.C. Supply and erection of 39 Group "A" pre-stressed spun concrete columns with 140 W sodium lamps/lanterns along Manchester Rd. —See 11 Aug. issue.

8 Sept.—Guildford B.C. Supply, erection, cabling and bringing into service of 117 Class "A" lighting along A3100, A246 and A321.—Advertised 11 Aug. issue.

9 Sept.—Glasgow T.C. Supply of 5,000 bracket fittings for lighting stairs. Lighting Dept., 20 Trongate.

9 Sept.—Luton B.C. Electrical installation in Challney CSM School extension. Borough Architect, Town Hall.

9 Sept.—Worksop B.C. (1) Supply of lanterns, lamps and auxiliary equipment; (2) removal of existing units, supply of new columns, wiring and fitting of equipment; (3) alternatively, whole of work for 100 140 W sodium units on 25 ft columns. Borough Engineer, Park Hse. Deposit £3 3s. —Advertised in this issue.

9 Sept.—Wrexham B.C. Supply and erection of Scheme 4 Groups "A" and "B" columns, brackets, lanterns and lamps. Engineer and Surveyor, 31 Chester St.—Advertised in this issue.

10 Sept.—Waterford C.C. Supply of two 20 g.p.m. centrifugal pumps and motors for Kill and Bonmahon Water Supply Scheme.—See 28 July issue.

10 Sept.—Willenhall U.D.C. Erection of 92 Stanton 9A concrete columns and provision/fixing of 80 W mercury lanterns/lamps with necessary wiring—See 4 Aug. issue.

10 Sept.—Youghal U.D.C. Duplicate pumps with 190 g.p.m. combined capacity and another pair for 1,410 g.p.m. at a maximum static lift of 53 ft. Details from consulting engineers, N. O'Dwyer and Ptnrs, 6 Burlington Rd, Dublin. Deposit £5 5s.

13 Sept.—Londonderry R.D.C. Electrical installations in 18 dwellings, Altinure, and 16 dwellings, Claudy Brae.—See 11 Aug. issue.

No date stated—Whitby U.D.C. Supply and erection of 117 Group "A" steel octagonal columns, five wall brackets, seven Group "B" steel columns with 250 W colour-corrected mercury and 80 W mercury fluorescent lamps/lanterns/control gear.—See 4 Aug. issue.

CONTRACTS PLACED

Durham C.C. Wiring of smallholdings on Sedgefield estate: Nos. 1 and 2, F. Warren (Electrical) Ltd., £263 13s 9d; Nos. 3 and 4 plus 5 and 6, J. Paterson and Co., £586 11s 3d and £703 7s 8d respectively. Provision of loudspeaker system at new fire brigade H.Q. at Framwellgate Moor, Tannoy Products, £567 9s 2d.

Gateshead T.C. Electric installations in: Gateshead Technical College (Stage 3), Robson and Coleman Ltd., £9,627; Elgin Secondary Technical School, Borough Engineer's Dept., £11,700.

Manchester C.C. Electrical installation in Arnfield treatment works control and administration building, East Manchester Contractors Ltd.; shops and maisonnettes at Lomond Rd, Peel Hall, Simmons Electrical Contracting Co.; lift conversion and modification work in Town Hall extension, Otis Elevator Co. Ltd. Recommended.

Newcastle upon Tyne Hospital Board. Electrical work in operating suite Stockton and Thornaby Hospital, Graham Bros. (Electrical Engineers) Ltd., £1,764; Board H.Q. additions, Robson and Coleman Ltd., £438 12s 10d. Reorganisation of engineering services at Newcastle General, North of England Engineering and Electrical Co. Ltd., £14,687. Telephone installation at South Shields General Hospital, A.E.I. Ltd., £3,300.

Peterborough. Electrical work in St. Mark's County School for Joint Education Board, Peterborough and District Electrical Services, £1,156 7s 8d.

Wallsend T.C. Provision of street lighting along Coast Rd, North Eastern E.B., £500.

Wessex Hospital Board. Provision of: electrical services in nurses' training school, Lord Mayor Treloar Hospital, R. F. Webb Ltd., £620; lift at Rooksdown Hse, Park Prewett Hospital, Evans Lifts Ltd., £2,145; lift in St Mary's Hospital, Pickerings Ltd., £3,764; electrical services in ancillary stores, etc., at St. James' Hospital, G. Taylor and Co. (London) Ltd., £1,699; electrical services in senior nurses' training school, Salisbury General Hospital, E. W. Forster, £713; bed/passenger lift at Royal Hampshire County Hospital, Otis Elevator Co., £5,071; electrical services in new office block, Highcroft, Winchester, Dicks Ltd., £1,904. Recommended.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

25 Aug.—New Zealand. Four items 1·1 and 11 kV underground cable, from 500 to 2,500 yd; 1,500 yd pilot and telephone cable and joint boxes. Town Clerk, P.O. Box 937, Hamilton. B.o.T. (ESB/19570/60).

26 Aug.—Rhodesia and Nyasaland. 24,400 ft underground armoured telephone cable for airports. Secretary, Federal Tender Board, P.O. Box 8075, Causeway, Salisbury. B.o.T. (ESB/20155/60).*

26 Aug.—South Africa. (1) 6,600 ft and 2,640 ft ·25 sq in. three-core 33 kV cable; (2) 500 medium angle, side-entry street lighting lanterns for 300 and 500 W tungsten and 400 mercury lamps. Town Clerk's Office, City Hall, West St, Durban. B.o.T. (ESB/20370 and 1/60).*

26 Aug.—Thailand. 6,000 32 V and 800 220 V 25 W lamps. State Railways of Thailand. B.o.T. (ESB/20726/60).*

29 Aug.—Burma. 550 yd 0·1 sq in. four-core 660/1,100 V cable. 1,000 60 W 230 V e.s. bulbs. B.o.T. (ESB/20549/50/60).*

30 Aug.—America. Three duplex control boards for 230 kV and 115 kV and one set of unmounted switchgear for Fargo, Jamestown and Grand Forks substations. Department of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center, Denver 25, Colorado. B.o.T. (ESB/20389/60).*

31 Aug.—Canada. Two 5 kV 250 MVA substation switchgear units for City of Winnipeg H.E. System. Chairman, Committee on Utilities and Personnel, c/o City Clerk, City Hall, Winnipeg 2. B.o.T. (ESB/20382/60).*

TRADE NOTES

BEAMA Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 12 Aug, 1960, shall be deemed to be 204s 6d; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry at 12 Aug, 1960, is 117·2* (181·8*).

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 12 Aug, 1960, shall be deemed to be 204s 6d; (*b*) "Cost of Material"—the index figure for Materials used in the Mechanical Engineering Industry at 12 Aug, 1960, is 126·5* (190·1*). "Blast Furnaces and Iron and Steel Melting and Rolling (1948 S.I.C. ref. 40/41)," 188·6*. Other Steel Goods, excluding tubes (1958 S.I.C. ref. 311/2), 128·5*. The price of brass condenser tubes ¾ in. o/d 18 s.w.g. on 12 Aug, 1960, is 4s 1¼d per lb. *Provisional figure.

The figures in parentheses shown above relate to the earliest list of wholesale price index numbers in which the year 1949 is taken as the base 100. For the other figures 1954 = 100.

Distribution Arrangement. PTFE glass fabrics by Wandleside Warren Wire Co. Ltd. to be marketed through the textile division of Henry Simon Ltd., Cheadle Heath, Stockport.

Mexico Imports. Now subject to prior import licences: electronic bulbs; machines for recovering cathodes and metallic filaments, wire cutting and forming, and grid assemblers; structures of bulbs; filament heaters.

BUSINESS PROSPECTS

Alton. Maxwell Aylwin, 26 West St, Farnham, Surrey, architect for £125,000 school, Holybourne.

Amersham R.D.C. Tender: two blocks multi-storey flats; one block multi-storey offices and Council Chambers, Civic Centre site. Clerk.

Annfield Plain. J. H. Napper and Ptnrs, 133 Osborne Rd, Newcastle, architects for additions to Ransome and Marles Bearing Co. works, Pilgrim St.

Barnsley B.C. Tender: 80 dwellings, various sites. Engineer.

Basildon. Ove Arup and Ptnrs, 8 Fitzroy St W.1., consulting engineers for York Shipley Ltd. factory.

Basingstoke. Associated Transistors Ltd. plan factory on 120,000 sq ft site, Houndsfield industrial estate.—Lansing-Bagnall, Kingsclere Rd, plan office building.

Bath T.C. Tender: 94 dwellings, garages and laundry, Snow Hill Redevelopment. Architects: Snailum and Le Fevre, 18 Brock St. C. P. Unwin and Sons, 33 St. Peter St, Tiverton, Devon, contractors for £114,100 C. and J. Clark's Rush Hill factory.

Belfast. Robert McKinstry, 58 Rugby Rd, architects for The Presbyterian Church in Ireland's students' hostel and community centre, College Park East.

Bentley. Prosper de Mulder Ltd., Ings Rd, Doncaster, plan £100,000 buildings.

Birmingham. Thomas Smith and Sons, Saltley Mills, Alderley Rd, Saltley, plan new Coleshill factory.—Gresham Holdings, 55 Cornwall St, to build two Tyseley estate factories for Corporation.—Amalgamated Engineering Union, 22 Bennett's Hill, plan buildings on Smallbrook/Ringway junction site.

Bishop Auckland U.D.C. Tenders soon for 85 Woodhouse Close estate houses. Surveyor.

Bolton. G. and J. Seddon, Little Hulton. Walkden, contractors for foundry, machine shops, etc., Union Rd area, for Walmsley (Bury) Group Ltd.

Bournemouth. Wessex Regional Hospital Board to approve: planned Royal Victoria Hospital, Westbourne out-patients' dept.; works at Christchurch Hospital; mental patients' accommodation at St. Mary's Hospital, I.o.W.; adaptations to nurses' home and therapy dept. at Herrison Hospital, Dorchester.—Greens and Cross, 2a Holderness Rd, architects for 18-storey hotel, conference centre with eight shops, etc., on Royal Exeter Hotel site.

Bradford. W. and J. Whitehead plan Dick La, Laisterdyke, factory extensions.

Brighton. West Instruments, 51 Regent St, Brighton 1, plan factory, The Hyde.

Buxton. Cintride Ltd., Ecclesfield Rd, Sheffield 5, plan Buxton Rd factory.

Cardiff. Corona Ltd. plan £200,000 bottling factory. Tender: 70 dwellings, various sites. Architect.

Carmarthens. Tender: 20 houses, Penybont, for Joint Police and Fire Auth. Clerk, County Hall.

Chorley. Manchester Hospital Board plan Chorley and District Hospital nurses' home extensions.

Croydon. Truett and Steel, 7 High St, Thornton Heath, Surrey, contractors for £65,000 Godfrey Phillips' Mill La factory.

Dagenham. J. Ellman and Son, 46 Copperfield Rd E.3, plan furniture factory, Oxlow La.—Durable Suites Ltd., Fowler Rd, Hainault industrial estate plan factory and office block.—Kelvin and Hughes plan Selinas La factory extensions.—Gla-Rev Products plan Fowler Rd, Hainault industrial estate, factory.

Denbighshire C.C. Tender: three-form secondary school, Llanrwst, for Education Committee.

Dorking U.D.C. Tender: 29 dwellings, Hampstead Rd. Architects: Howard V. Lobb and Ptnrs.

Dunstable. Peter Dunham, Widdup and Harrison, 2 Union St, architects for £60,000 Hawthorne Baker Ltd. factory, Nicholas La.

Durham C.C. Clayton and Deas, High Row Chmbrs, Darlington, architects for High Coniscliffe County Primary School; Tarren and Caller, 2 Front St, Sedgefield, architects for Leam La, Felling, community centre. Felling health centre planned.

Edinburgh. Governors of College of Art plan £250,000 extension scheme.

Enfield. Planned: Crown Rd factory for Chamberlain Group of Companies, Staffa Rd E.10.—Factory, Gt Cambridge Rd, for Thorn Electrical Industries, Upper St. Martin's La W.C.2.—Alexandra Rd factory for Barton Forge and Iron Works, Ponders End.—Factory for Spencer Heath and George, Garfield Rd, at Crown Works, Southbury Rd.—Factory and offices, fire station site, Bilton Way, for Percy Bilton Ltd., 52 Uxbridge Rd W.5.

Gateshead B.C. Tender: Greenwell County Secondary School. Engineer.

Glasgow. Boswell, Mitchell and Johnston, 256 West George St C.2, architects for Royal Samaritan Hospital maternity unit.

Goole. Town and City Properties, Kingsbury Hse, King St S.W.1, plan 33 two-storey shops, Boothferry area on Market Hall site.

Harrogate. Busbys (Bradford), Manningham La, Bradford 1, plan reconstruction of Oxford St departmental store.

Hove B.C. Tender: 26 houses, 36 flats, Chichester Close. Engineer.

Hull. Arthur Lazenby, 101 Spring Bank, architect for Gt Field Estate district clinic for City Health Committee.

Ilford B.C. Tender: Assembly Hall and Gym, Mayfield school for girls.—Tender: St. Augustine's school extensions. Engineer.

Isleworth. Dodge and Reid, 72 High St, Brentford, architects for Gillette Industries factory reconstructions, Gt West Rd.

Kettering T.C. plans 173 houses, Barton Seagrave council estate.

Lancs C.C. Residential hostel, Training College, Padgate, Warrington, planned.

Leeds T.C. Tender: 172 dwellings, Raynville Rd and Brooklands, and 16 flats, Brackenwood. Architect.

London. Percy Bilton, 52 Uxbridge Rd W.5., contractor for £125,000 bottling depot, West Ferry Rd E.14, for Beecham Group.—Feldman and Bennett, 12 Queen Sq, Brighton, architects for Scutton St E.C.2. factory.—London Electrical Manufacturers Ltd. plan lease of 71,000 sq ft Wood La depot land from Kensington B.C.—Wood Green factory blocks at Bounds Green Industrial Estate planned by B.C.—C.C. Welfare Committee approves £163,800 scheme for Ladywell Hse home; £29,248 is for heating and electrical installations.—Stanley Bragg and Assoc, 119-121 High St, Witham, Essex, architects for Flodden Rd S.E.5, students' hostel.—Raworth Hill and Browne, 16 Wimpole St W.1, architects for Cavendish Sq Training College extensions.—Stewart and Shirley Thomson, 19 Brompton Sq S.W.1, architects for Lisson Grove area developments, including 30-storey office block, 20-storey flats, shops, cinema, etc.—Devereaux and Davies, 3 Gower St W.C.1, architects for tube station buildings, and office block, Lambeth North Underground station, Westminster Bdge Rd S.E.1.—Herbert J. Brewster, 16 Porchester Pl W.C.2, architect for seven-storey hotel extension, 20 Talbot Sq, Paddington.—Trehearne and Norman, Preston and Ptnrs, 83 Kingsway W.1, architects for £100,000 Montague Mansions flats conversion scheme for L.C.C. Freehold and Leasehold Properties Ltd., 58 Albert Ct. Kensington Gore S.W.7.—R Seifert and Ptnrs, 38 Gt Ormond St W.C.1, architects for Royal Palace Hotel rebuilding, Kensington High St W.—Stafford and Pollard, 24 Princess St, Hanover Sq W.1, architects for £600,000 blocks flats, S. Kensington.—Erno Goldfinger, 69 Piccadilly W.1, architect for 17-storey block flats, Avenue Rd N.W.—Provestment Ltd. plan showrooms, offices and motel at Lisson Grove and Bendall Mews N.W.1.—F. W. Walker, Estate Office, Heddon Ct, Cockfosters, Southgate N, plans two-storey Cockfosters Rd building.—C. E. Owen Ward, Midland Bank Chambers, Aldermans Hill N.13, architect for 28 dwelling flat block, St. John's Vicarage N.13.

Manchester T.C. Tender: 370 Blackley New Rd dwellings. Director of Housing.—Tender: Ducie Secondary Technical School, Moss Side. Architect.

Mansfield. Maun Industries, Moor La, plan new factory.—Foister Clay and Ward plan new Southwell Rd West factory.—Union and Plantation St warehouse for Underpressure Engineering Co.—W. and J. Linney plan additions to Newgate La printing works.

Middlesex C.C. Education Committee plan hostel and canteen, etc., Trent Park College, £44,122.

Newcastle. M. and H. Gatoff, 26 Mosely St, architects for three-storey Duke St factory for Hutchinson and Co.—Hepworths, 73 Clayton St, plan £100,000 new store buildings, Blackett St. Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street, Co. Durham, architects for United Automobile Services Ltd. offices, Portland Terr.—L. Auton, Regent Bldgs, York Rd, W. Hartlepool, architect for Newcastle and District Dairies offices and loading bay.—Waring and Netts, 36 Jesmond Rd, architects for D. Levey's four-storey office-restaurant building and Louis Hotels' three-storey extensions at Imperial Hotel.

Newport (Mon.). Corporation plans £92,250 Gaer Rd home scheme.

Northallerton. Hospital Management Committee plans two Friarage Hospital operating theatres at £50,000. Chief Architect.

Northumberland C.C. Health and welfare centre schemes and ambulance depot total cost £68,326 planned.

Norwich. R. G. Carter, Drayton, contractors for £400,000 Kingswich Hall Training College extensions. Feilden and Mawson, 71a The Close, architects for Grove Rd hotel, offices.

Nottingham. R. G. Lawrence Stratton, Strawless Hall, plans seven-storey block offices on old brewery site, Victoria station, £400,000.

Oxford. Howell, Killick and Partridge, 82 South Hill Park, Hampstead N.W.3, architects for £80,000 St. Anne's College building, St. Clements, for Magdalen College planned.—Residential accommodation and shops.

Peterborough. Queensland Properties Ltd., 66 Haymarket S.W.1, plan conversion of White Hart Hotel to shops, etc.

Plymouth. Dudley Coles Ltd., Bath St, contractors for £131,203 factory, Burrington estate, for Griffin and George.

Portsmouth. T. K. Makins, 4 Landport Terr, architect for new centre St. Mary's Hospital.

Rainford. James Grundy and Co., Brownlow St, St. Helens, Lancs, plan factory and office block on five-acre site.

Richmond (Yorks) R.D.C. 40 Colborn houses planned.

Ripon. Governors of Training College plan staff hostel, etc.

Reading. £16,150 Adelaide Ward modernisation at Royal Berkshire Hospital planned.

Romford. New industrial premises, etc., planned on four-acre Colliers Row Rd site by The Bernard Sunley Organisation, 25 Berkeley Sq W.1, for ICI Ltd., Millbank S.W.1.

Sheffield. New maternity dept. and residential accommodation planned City Hospital, Derby.

Shipston-on-Stour. Shipston Engineering Co. plan extension of Morgren Wks, Campden Rd.

Shrewsbury B.C. Tender: alterations to Music Hall—new kitchen, catering equipment, passenger/goods lift, etc. Surveyor.

Business Prospects continued

Slough. N.W. Metropolitan Regional Hospital Board, Tender: new hospital Wexham Park; 300 beds, out-patients, casualty and operating theatre. Board's architects: Powell and Moya, 36 Gt. Smith St, S.W.1.

Southampton. Wimpson Body Wks, Peel St, Northam, plan workshop offices.

Spennymoor U.D.C. 16 Tudhoe Moor houses and 24 Byers Green. Architects, G. H. Gray and Ptnrs., Camden St, N. Shields.

Stockton-on-Tees. North Tees Hospital Management Committee recommends £12,000 boiler plan Stockton Children's Hospital, £10,000 Stockton and Thornaby Hospital extensions and lift at Portrack Hospital.

Sunderland. A. Jobling and Co., Wear Glass Wks, plan £200,000 factory; part of £2 million expansion scheme.—T.C. Tender: 10 two-storey flats Pennywell. Architect.

Swadlincote. National Coal Board, 69 Lower Parliament St, Nottingham, plan medical centre workshops, etc., Cadley Hill Colliery.

Swindon. Oxford Regional Hospital Board plan £23,107 conversion of Princess Margaret Hospital.

Wallsend. F. Gibson and Co., Haddricksmill Rd, Gosforth plan concrete factory, Bewicke Rd.

Walford. Walford Farm Institute extensions planned at Agricultural College.

Warwicks. Welfare Committee plan Oliver St, Rugby, home, £54,900.

W. Hartlepool. T.C. plans 35 central redevelopment area dwellings. Architect.

W. Kesteven R.D.C. plans 14 Colsterworth houses, Bourne Rd. Surveyor.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Aquadom Ltd., Rustington Estate Office, Station Rd, Rustington, Sussex. To carry on business of constructors of railways, tramways, gas, electricity and water works, etc. Nom. cap.: £125. Dirs.: Geoffrey W. Maides, John H. Maides and William F. Pleasance.

Bardon Electrics Ltd., 54 Allerton Rd, Woolton, Liverpool. Nom. cap.: £500. Dirs.: Bernard R. Radcliffe and Mrs Sylvia Radcliffe.

K. J. Bradbury and Son Ltd., 3 Craddocks Parade, Ashtead, Surrey. Manufacturers of and dealers in washing machines, domestic appliances, etc. Nom. cap.: £2,000. Dirs.: Kenneth J. Bradbury and Mrs Frances M. Bradbury.

C. and D. Electrics (Camelford) Ltd., 22-24 Fore St, Camelford, Cornwall. Nom. cap.: £100. Dirs.: Ronald F. Boykett and John B. Noble.

J. Crotty Ltd., 1 Hyde Park Pl W.2. Heating, ventilating and electrical engineers, etc. Nom. cap.: £100. Dirs.: John Crotty and Mrs Gladys I. Crotty.

Electrofreeze (Southampton) Ltd., 11a Southgate St, Winchester, Hants. Nom. cap.: £5,000. Dirs.: Stanley A. Buchan, Edwin J. Hayward and Geoffrey D. Goodwin.

Electronics and Instrumentation Ltd., 274 High St W.3. Designers, manufacturers of and dealers in transistors, etc. Nom. cap.: £1,000. Dirs.: Eric Bamford and Florence Y. Bamford.

Europa Electronics Ltd., 3 Shelton New Rd, Hanley, Stoke-on-Trent. Nom. cap.: £2,000. Permanent dirs.: Albert G. Pearson and Mrs L. Pearson.

Gravesend Electrical Installation Co. Ltd., 48 Windmill St, Gravesend, Kent. Nom. cap.: £100. Dirs.: George W. Pearce and George H. Pearce.

E. C. Hancox Ltd., 1 Westhill Rd, Coventry. Television and electrical engineers, etc. Nom. cap.: £500. Permanent dirs.: Edward C. Hancox and Mrs B. Hancox.

High Vacuum Engineering Ltd. To acquire and hold shares and debentures or other securities of Vacuum Research (Cambridge) Ltd., and of Bourdon Tools Ltd., etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: D. T. Milton and F. W. Cranfield, 53 Cornhill E.C.3.

Laking Installations Ltd., 138-139 Bush Hse, Aldwych W.C.2. Installers of central heating and other electrical works, etc. Nom. cap.: £100. Dirs.: Lisetta Laking, Trevor Maxwell and Stanley Frost.

Morleys Installations Ltd., 117 Hornsey Rd N.7. Electrical contractors, etc. Nom. cap.: £100. Dirs.: Sam Morley, Morleys Electrical Services (Holloway) Ltd.

Oates Electrical Ltd., Four La Ends, Horsley Woodhouse, Derbys. To take over business of electrical engineers and contractors carried on as "Oates Electrical," etc. Nom. cap.: £2,000. Permanent dirs.: Roy Oates and Rosalie A. Oates.

N. and V. Patterson Ltd., Balfour Hse, Finsbury Pavement, E.C.2. Manufacturers of and dealers in electrical goods, radio and television receivers, etc. Nom. cap.: £100. Dirs.: Norman Patterson and Mrs Victoria Patterson.

P. and J. Electrics Ltd., 56a High St, Uxbridge. Nom. cap.: £500. Permanent dirs.: Peter J. Fairclough and Mrs June M. Fairclough.

H. B. Reeder Ltd., 10 Spaines Rd, Fartown, Huddersfield. To take over business of a radio, television and general electrical engineer carried on at Fartown, Huddersfield, by Harold B. Reeder, etc. Nom. cap.: £5,000. Dir.: Harold B. Reeder.

Romsley Manufacturing Co. Ltd. Manufacturers of and dealers in washing machines, spin dryers, food mixers, hair dryers, etc. Nom. cap.: £100. Dirs.: Thomas H. Silk and Mrs C. R. Silk, Oatlands, Fieldhouse La, Romsley, Worcs.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aerialite Rota-rinse. 798,650. Class 7. Washing, rinsing and drying machines. Aerialite Ltd., Castle Wks, Stalybridge, Ches.

Astralecon. 802,627. Class 9. Transmission systems, switches, etc. Astral Switchgear Ltd., Alma Rd, Enfield, Middx.

Calidec. 789,918. Class 11. Low temperature heaters in the form of insulated cables. Calidec Ltd., Station Rd, Dorridge, Solihull, Warwicks.

Dreamline. B794,423. Class 9. Kitchen utensils, irons, vacuum cleaners, etc. B794,424. Class 11. Refrigerators, cooking apparatus, etc. Domestic Electric Rentals Ltd., Television Hse, 3 The Green, Twickenham.

Esilec. 805,141. Class 11. All goods. Engineering Service Installations Ltd., 258 Gray's Inn Rd, W.C.1.

Lektrocel. B799,062. Class 11. Refrigerating and cooling units, etc. Dole Refrigerating Co, 5910 North Pulaski Rd, Chicago 46, Illinois, USA.

Logicon. 803,871. Class 9. Control apparatus, etc. Associated Electrical Industries Ltd., 33 Grosvenor Pl, S.W.1.

Marinair. B799,406. Class 11. Air conditioning and ventilating installations, etc. Carrier Eng. Co. Ltd., 24 Buckingham Gate, S.W.1.

Turnasil. 793,937. Class 17. Heat, sound and electrical insulating materials of glass, etc. Turner Bros. Asbestos Co. Ltd., Asbestos Hse, 77-79 Fountain St, Manchester 2.

Xpelair. 792,732. Class 11. Fans. Woods of Colchester Ltd., Braiswick Wks, Colchester.

Zodiac. 799,654. Class 10. Blankets. Denhams (Norwich) Ltd., St. George's Wks, All Saints Rd, W.3.

Gazette Announcements

COMPANIES ACTS

Foster and Thomas Ltd. Mr G. A. Wale, of Latham and Co., Walter Hse, 418-422, Strand, W.C.2, appointed liquidator at extraordinary general meeting on 29 July for the purpose of voluntarily winding up.

New Century Electric Ltd. Meeting of creditors to be held at Bonnington Hotel, Southampton Row, W.C.1, on 31 Aug. at 3 p.m.

Electric Supply Corporation (Overseas) Ltd. Meeting of members to be held at 72 Moorgate, E.C.2, on 15 Sept. at 12 noon for the purpose of having an account of the winding up laid before them.

Brown and Hicks (Electrical) Ltd. Mr R. A. Hawken, Bank Chambers, 1 John St, Bedford Row, W.C.1, appointed liquidator as from 12 July.

Direct Electrics Supply Co. Ltd. Meetings of members and creditors to be held at offices of Alfred Tooke and Co., 100 Park St, W.1, on 2 Sept. at 11 and 11.30 a.m., respectively.

Domestilec Ltd. Meeting of members to be held at 43 Church Rd, Hove 3, on 12 Sept. at 12 noon for the purpose of having an account of the winding up laid before them.

Moraheat Co. Ltd. Last day for receiving proofs for intended dividend 26 Aug. to liquidator, W. Le'Resche Hand, Colmore Hse, 21 Waterloo St, Birmingham 2.

Robinson of Eastleigh Ltd. Resolution for voluntarily winding up passed at extraordinary general meeting on 8 Aug. Creditors to send details to liquidator, R. G. B. Booth, 21 The Ave, Southampton, by 30 Sept.

R.T.E. Electrics Ltd. Meeting of creditors to be held at Dixon Hse, 128-136 High St, Edgware, Middx, on 22 Aug. at 10 a.m.

Polas Ltd. Mr J. D. Askew, 27 Rodney Rd, Cheltenham, appointed liquidator at extraordinary general meeting on 3 Aug. for the purpose of vountarily winding up.

Voluntary Liquidation

Electronic Services (Staines) Ltd., electrical and radio dealers.

Liabilities totalling £7,035, of which £6,430 was owing to trade and general creditors were disclosed at the recent meeting of creditors. Book value assets of £3,646 were estimated to realise £2,400, less £96 for preferential claims, leaving net assets of £2,304, which, with the £1,000 issued share capital, left, so far as the shareholders were concerned, a total deficiency of £5,731.

Mr G. W. Wale, of Lathom and Co., 418-422 Strand, W.C.2., was appointed as liquidator, together with the committee of inspection.

BANKRUPTCY ACTS

Receiving Order

Sheffield. A. W. Westlake, electrician, carrying on business at 42 Park Rd, Conisbrough. Receiving order dated 5 Aug.

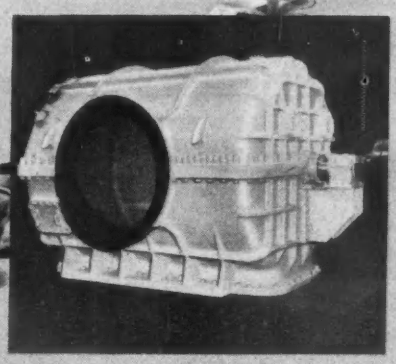
First Meeting and Public Examinations

Sheffield. S. D. Archer, domestic electrical appliance retailer, carrying on business as "Telefix" at 100 Attercliffe Common. Public examination: 2 p.m. 10 Nov. at County Court, Bank St, Sheffield.

High Court of Justice. P. Connelly, electrician, of 6 Rayne Court, N.18. First meeting: 11 a.m., 24 Aug.; and public examination: 11 a.m., 20 Oct.; both at Bankruptcy Bldgs, Carey St, W.C.2.

Appointment of Trustees

Cardiff. P. J. Ferris, domestic electric appliance retailer, formerly carrying on business as Ferris Domestic Appliances at 5 King's Rd, Canton. Mr G. H. Down, 106 Walter Rd, Swansea, appointed trustee as from 29 July.



Enough water for 100,000,000 cups of tea an hour....

flows through a large 'Deptford' Rotary Water Strainer. The strainer consists of a rotating perforated drum, rolled from naval brass plate and the water flows into it through 3/16th inch diameter perforations. The debris collects on the outside of the drum and is scraped off by a fixed, phosphor bronze, blade. Cleaning is continuous and entirely automatic and back-washing is not required. Sludge is flushed out of the hopper beneath the strainer at intervals, without interrupting the flow. 'Deptford' Strainers are made in a number of sizes, with capacities up to 5,000,000 g.p.h.

A fully illustrated brochure is available upon request.

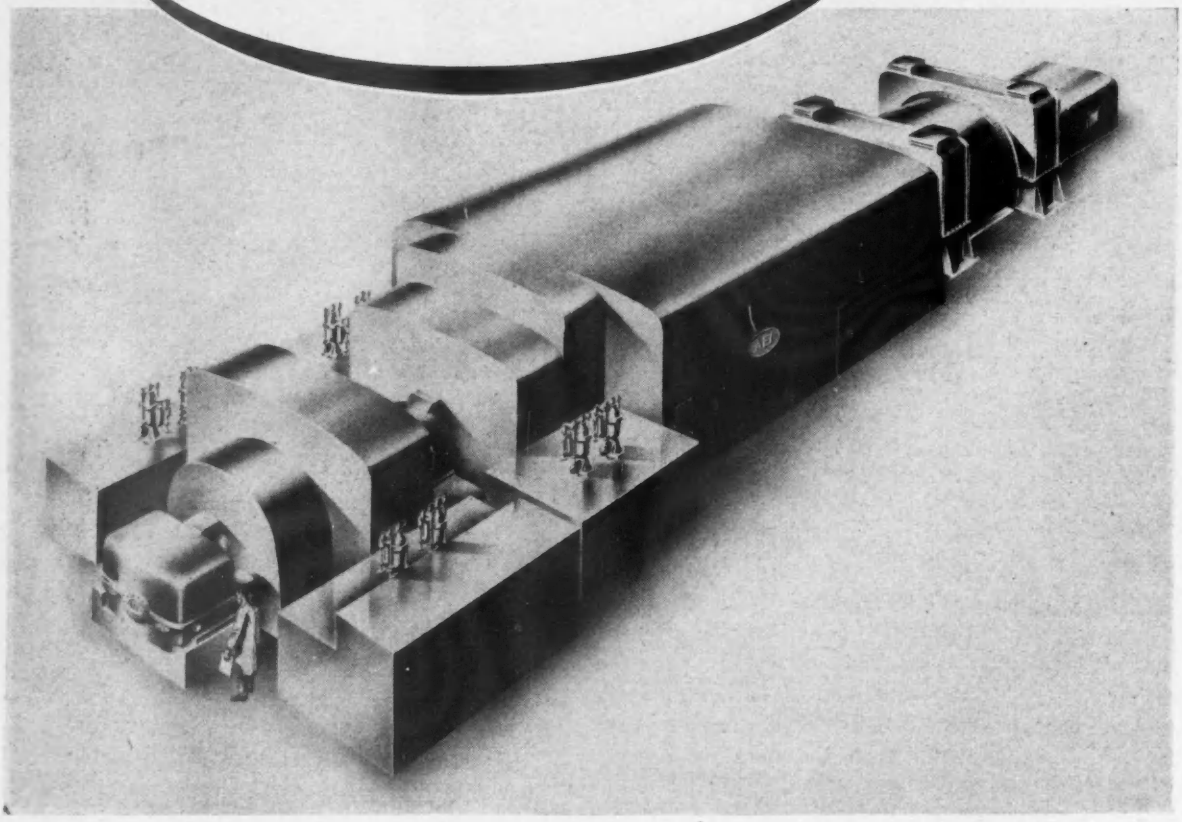
RICHARDSONS WESTGARTH (HARTLEPOOL) LTD

A member of the RICHARDSONS WESTGARTH GROUP

HARTLEPOOL, CO. DURHAM AND AT 58 VICTORIA STREET, LONDON, S.W.1
59 MOSLEY STREET, MANCHESTER, 75 BUCHANAN STREET, GLASGOW

R.W.S.

A New Step
IN GENERATION



A new step in the development of power generating plant in Britain has been taken with the decision of the Central Electricity Generating Board to install large output turbine-generators operating at super-critical steam conditions. AEI, Britain's largest turbine-generator manufacturer, has received an order to build such a set with an output of 375 MW.

A 375 MW SUPER-CRITICAL TURBINE GENERATOR

Artist's impression of a 375 MW Super-critical Turbine-generator to be built for the C.E.G.B. Power Station at Drakelow. The turbine will have four cylinders arranged on a single axis operating at inlet steam conditions of 3,500 psig and 1,100°F. with reheat to 1050°F. The generator will be hydrogen-cooled with water-cooled stator windings, a system delevoped by AEI.

AEI

Turbine-Generator Division
Associated Electrical Industries Limited
WORKS AT MANCHESTER - RUGBY - GLASGOW - LARNE

B/A006

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

ELECTRICAL WHOLESALERS RETAILERS

AND HEATING INSTALLATION ENGINEERS

VISIT

the

HOME HEATING EXHIBITION

at the

ROYAL HORTICULTURAL SOCIETY'S NEW HALL

ELVERTON ST., S.W.1

(Between Victoria St. and Vincent Sq. Nearest Tube, St. James's Park)

AUGUST 19 to 25

★

OPEN 10 a.m. to 8 p.m.

★

ADMISSION BY TRADE CARD OR COMPLIMENTARY TICKET AVAILABLE FROM SPECIALISED EXHIBITIONS LTD., 22 HALF MOON ST., W.1 (Telephone: GRO 4503)

★

This first national show of domestic heating equipment is also open to the public, but will contain much of particular interest to electrical traders and contractors.

★

DON'T MISS IT!

(R 722)

TENDERS INVITED

BOROUGH OF WREXHAM

Groups "A" and "B" Street Lighting

Scheme No. 4

FIXED priced tenders are invited for the supply and delivery and erection of Street Lighting Columns, Brackets, Lanterns and Lamps.

Conditions of Contract may be inspected at the office of the Borough Engineer and Surveyor, 31 Chester St, Wrexham, from whom copies of the Specification, Bill of Quantities and forms of Tender may be obtained.

Tender to be delivered in a plain envelope, sealed and endorsed "Street Lighting Scheme No. 4" to the undersigned not later than 12 noon on Friday, 9 Sept., 1960.

PHILIP J. WALTERS,
Town Clerk.

Guildhall,
Wrexham.
Aug., 1960. (R 708)

BOROUGH OF COLWYN BAY

Trunk Road A.55—Lighting, Section 6

TENDERS are invited for the provision and erection of 5 No. Class "A" Concrete lighting columns, together with lanterns, control gear, etc.

Tender documents may be obtained upon application to Mr H. WILMAN, A.M.I.C.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Rd, Colwyn Bay.

Tenders in plain, sealed envelopes endorsed "Trunk Road Lighting, Sec. 6" must be delivered to the undersigned not later than 12 noon on Monday, 29 Aug., 1960.

The Council do not bind themselves to accept the lowest or any tender.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall,
Colwyn Bay.
8 Aug., 1960. (R 684)

BOROUGH OF WORKSOP

Street Lighting

TENDERS are invited from bona-fide contractors for the removal of existing street lighting standards and for the supply, erection and servicing of the undermentioned street lighting units:

100 sodium lanterns, 140 W, mounted on 25 ft steel columns.

Tenderers may quote for:

1. Supplying only the lanterns, auxiliary equipment and lamps; or
2. The removal of existing lighting units and the supply of new standards, together with the wiring and fitting of all equipment; or
3. The whole of the work required.

Copies of the specification, bills of quantities and forms of tender may be obtained from the Borough Engineer, Park Hse, Worksop, upon payment of a deposit of £3 3s, which will be reimbursed upon the receipt of a bona-fide tender and the return of all documents supplied.

continued in next column

continued from previous column

Tenders, in sealed envelopes, endorsed "Street Lighting," must reach the undersigned not later than noon on Friday, 9 Sept, 1960.

The lowest or any tender will not necessarily be accepted.

RUSSELL C. PHARAOH,
Town Clerk.

Town Hall,
WORKSOP,
Notts. (R 745)

CITY OF MANCHESTER

TENDERS are invited for the supply of the following items of street lighting equipment during the period 1 Jan. to 31 Dec., 1961:

- Cable
- Concrete Standards
- Flashing Beacon Globes
- Fluorescent External Lighting Fittings for Road Signs
- Glass Globes
- Lanterns
- Mantles
- Steel Standards
- Time Switches
- Traffic Bollards

Tender forms, returnable by 6 Sept., 1960, from the City Surveyor, Town Hall, Manchester 2. (R 688)

APPOINTMENTS VACANT

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Port Talbot District of the Swansea and West Central Area of the Board.

Salary: N.J.B. Class H, Grade 7, Scale 10, £1,190/£1,325.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., 29 Ystrad Rd, Swansea Industrial Estate, Swansea, so as to arrive not later than Sat., 3 Sept., 1960. Please quote reference "154/60/ET."

Envelopes should be endorsed "Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(R 724)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

(a) THIRD ASSISTANT ENGINEER

(b) FOURTH ASSISTANT ENGINEER

REQUIRED in the System Design Section of the Divisional Electrical Department at Bristol.

Superannuation Scheme. Salary: N.J.B. Class AX, for post (a) Grade 8, Scale 10, £1,105/£1,325 per annum and for post (b) Grade 9, Scale 9, £1,005/£1,245 per annum.

The work includes System Design, use of A.C. and D.C. calculators and co-ordination of protective gear settings. Applicants should possess qualifications leading to A.M.I.E.E., and have a keen interest in transmission theory and system design; those for the higher grade should have had some experience of this work.

Previous applicants need not re-apply. (Please quote ET109/60.)

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 23 Aug., 1960. Please state clearly for which grade application is being made. (R 625)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

FEDERAL GOVERNMENT OF NIGERIA

ELECTRICAL INSPECTORS
MINISTRY OF MINES AND POWER

ELECTRICAL INSPECTORS required for inspection of electrical supply undertakings and large consumers installations such as factories, mines and oil wells with a view to enforcement of the appropriate regulations. Duties will also include the investigation of electrical accidents and possibly the conducting of enquiries into occurrences of this nature, together with any other duties prescribed by regulation. The work involves extensive travelling and absence from headquarters for extended periods.

Candidates should be corporate members of the Institution of Electrical Engineers, or eligible for membership. A university degree in engineering or a diploma issued by a recognised Electrical Engineering College or School, or both, would be an advantage. Candidates should have been apprenticed to an electrical supply undertaking or a large industrial undertaking and have subsequently had at least seven years' experience in a senior position involving the planning, erection and subsequent maintenance of electrical transmission and distribution systems or works electrical plants, and the construction of overhead power lines operated at voltages of 11 kV and over. A thorough knowledge of electrical supply and wiring regulations as they apply in the United Kingdom is essential. Knowledge of flameproof electrical installations is desirable. Experience of inspectorial work would be an advantage.

Salary: £1,434/£2,196 (including Inducement Addition) plus gratuity at rate of £150 per annum for satisfactory service. Outfit allowance of £60 is paid on salaries of up to £2,040 (including Inducement Addition). Appointment will be on contract for one or two tours of 12-18 months (length of tour dependent on candidate's age). Free passages for officer and wife. Children's allowances whilst separated. Leave at rate of seven days for each month of resident service. Income tax at low local rate. Rent at low cost.

Candidates should write for application forms and further particulars, stating briefly age, qualifications and experience, to the Appointments Secretary, Federal Public Service Commission, Nigeria Hse, 9 Northumberland Ave, London W.C.2, quoting Q.1/8. (R 686)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

South Staffs. & North Worcs. Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
(SMETHWICK/WEST BROMWICH)

Applicants should have had experience in all branches of distribution work including construction, operation and maintenance of high voltage and low voltage underground cables, overhead lines and substations. Technical qualifications desirable. Salary: £1,190/£1,325 per annum (N.J.B. Class K, Grade 9). Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary, to Mr H. A. P. Caddell, Sub-Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton.

Worcester & District Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
(WORCESTER)

Experience necessary in all branches of distribution work including construction, maintenance and operation of high and low voltage underground and overhead systems and substations. Technical qualifications desirable. Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr E. C. Watson, District Manager, Midlands Electricity Board, P.O. Box No. 16, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(R 705)

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments:

FOURTH ASSISTANT ENGINEER
DIVISIONAL ELECTRICAL DEPARTMENT
IPSWICH TECHNICAL SECTION (SUFFOLK)
(Staff Vacancy No. 1380)

Salary: N.J.B. Class AX, Grade 11, Scale 7, £855/£1,090 per annum.

The commencing salary will depend upon qualifications and experience.

Previous experience in the commissioning of high voltage electrical apparatus and the maintenance of associated protective gear is essential.

The appointment will provide a basis for promotion to a higher technical grade and applicants should possess a Higher National Certificate in Electrical Engineering or its equivalent.

The applicant appointed will be required to reside in the Ipswich area.

GENERAL ASSISTANT ENGINEER
LITTLE BARFORD GENERATING STATION
(ST. NEOTS, HUNTS)
(Staff Vacancy No. 1379)

Salary: N.J.B. Class J, within the range of Grades 17/14, Scales 1-4, £625/£870 per annum plus £90 Shift Allowance when required to work on shift.

The commencing salary will depend upon the duties and responsibilities.

Housing accommodation may be available for the successful applicant.

Duties of the above post include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a Generating Station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a Generating Station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, quoting the appropriate reference Staff Vacancy No., stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 27 Aug. (R 711)

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

Second Advertisement

SUB-AREA SECRETARY

APPLICANTS should have had wide administrative experience in a senior appointment in the Electricity Supply Industry. Membership of an appropriate professional body will be an advantage.

Salary: N.J.M. & H.E. Class C (Scale 5), £1,940/£2,140 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Rd, Bradford, not later than 26 Aug., 1960

No. 5 (Wakefield) Sub-Area

FOURTH ASSISTANT ENGINEER
(DISTRIBUTION DESIGN)

Applicants must hold at least the Higher National Certificate in Electrical Engineering and should have had some experience in the construction, operation and maintenance of Distribution Networks, and in the planning of H.V. and L.V. overhead and underground distribution systems, and the design of substations. Experience in the preparation of reports, load estimates and capital budgets is desirable.

Salary: N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 26 Aug., 1960. (R 652)

CITY OF SALISBURY

Southern Rhodesia

VACANCY FOR SENIOR ELECTRICAL ENGINEER (INSTALLATION)

SALARY SCALE:
£1,768 2s 6d x £51 5s—£1,921 17s 6d

APPLICATIONS are invited for the fixed establishment post of Senior Electrical Engineer (Installation) in the Salisbury Municipal Electricity Department, on the above scale, commencing salary at the minimum of the grade. No cost of living or other allowances are payable.

Candidates must be corporate members of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

The post requires experience in the general application of electricity to industrial commercial and domestic premises, the preparation of estimates for and planning of such installations, general knowledge of Electricity Regulations, and the commissioning and maintenance of electrical plant and installations. The successful candidate will serve in the Consumers' Engineer's Section as assistant to the Installation Engineer.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Davis and Soper Ltd., 52-54 St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 10 Sept., 1960. (R 676)

AIR MINISTRY

REQUIRE ASSISTANT MECHANICAL and ELECTRICAL ENGINEERS for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. Five-day week with four weeks' and two days' leave a year initially. Special allowance in addition to salary during overseas service. Qualifications and experience:

(i) (a) University degree or equivalent diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or
(b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or
(c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering experience with at least three years' apprenticeship; and

(ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/OA. (R 707)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY GENERATING BOARD
North Eastern and Yorkshire Region

TECHNICAL DEPARTMENT
YORKSHIRE DIVISION

APPLICATIONS are invited for the following appointments in the Technical Department, Yorkshire Division.

FOURTH ASSISTANT ENGINEER
(PROTECTION)
ROTHERHAM

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in the application or maintenance of control and protective equipments applied to high voltage transmission and generating systems.

FOURTH ASSISTANT ENGINEER (METERS)
LEEDS

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in the assembling and testing of electrical meters and instruments, preferably with summation equipment.

FOURTH ASSISTANT ENGINEER
(TELECOMMUNICATIONS)
ROTHERHAM

Applicants should have good technical qualifications and be experienced in application of telecommunication technique for supervisory telemetering and intertripping purposes as well as to automatic telephones. Works experience will be an advantage.

The salary for these appointments will be in accordance with the National Joint Board Agreement, Schedule B, Grade 11, BX (£855/£1,165 per annum).

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 31 Aug., 1960. (R 687)

MINISTRY OF WORKS
Requires

ELECTRICAL DRAUGHTSMEN FOR DUTY IN LONDON

APPLICANTS should be capable of designing Lighting and Power Distribution for various types of building. A knowledge of control wiring, H.T. and substation design is also desirable.

QUALIFICATIONS:

O.N.C. or equivalent standard.

SALARY:

(Now under review.) £570/£900 per annum, London (slightly less elsewhere) according to age and experience. Prospects of promotion to higher posts.

GENERAL CONDITIONS:

Five-day week, 3½ weeks Annual Leave in addition to Statutory holidays. Part-time day release for higher technical training in approved cases. Opportunities for non-contributory pensionable posts.

APPLICATIONS:

To the Chief Engineer, Ministry of Works, (A), Room 435, Abell Hse, John Islip St, London S.W.1, State age, experience, training and qualifications. Interviews at Regional Offices where possible. (R 638)

CENTRAL ELECTRICITY GENERATING BOARD
South Wales Division

Vacancy No. 206/ET/60

APPLICATIONS invited for the superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER at UPPER BOAT POWER STATION, PONTYPRIDD.

Salary: Schedule A, Class H, Grade 9, Scale 8, £1,040/£1,165 per annum, plus 10% shift enhancement.

Operating experience in a power station essential; appropriate engineering qualifications and regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-Fedwen Rd, Gabalfa, Cardiff, to be returned by 19 Aug., 1960. (R 681)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER
TECHNICAL SECTION

ENGINEERING DEPARTMENT
AREA BOARD HEADQUARTERS
MANCHESTER 8

Second Advertisement

APPLICATIONS are invited for a position as Third Assistant Engineer to assist with a variety of interesting investigations arising from the operation of an extensive distribution system ranging from dense city networks to scattered rural systems and operating at voltages up to 33 kV.

A sound technical education and training is essential and experience of operational work on an electricity supply system would be an advantage.

Salary Scale: £925/£1,215 p.a., Class BX, Grade 8. N.J.B. Conditions.

Application forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 3 Sept., 1960. (R 607)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE) TRANSMISSION

APPLICATIONS are invited for the above position in the Operations Branch of the Chief Engineer's Department. The successful applicant will be based at Alpha Pl, Chelsea, S.W.3, but may be required to undertake duties anywhere within the Board's area.

Applicants should have had a sound technical education and possess the Higher National Certificate. They should be experienced in Load Flow and Short Circuit calculations.

The post is graded under Schedule B of the National Joint Board Agreement as Grade 11, and the commencing salary within Class BX will be in the range £905 per annum to £1,215 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad Street, London E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3055/T. (R 674)

CITY OF SALISBURY
Southern Rhodesia

VACANCY FOR ELECTRICAL ENGINEER
SALARY: £1,025/£1,768 2s 6d.

APPLICATIONS are invited for the post of Electrical Engineer in the Salisbury Municipal Electricity Department, on the above scale.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and £1,614 7s 6d per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Davis and Soper Ltd., 52-54 St. Mary Axe, London E.C.3, to whom applications must be submitted on or before 3 Sept., 1960. (R 603)

SOUTH OF SCOTLAND ELECTRICITY BOARD
Fife Area

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for appointment as General Assistant Engineer to undertake the duties of Surveyor with the Construction Department, East Port, Dunfermline. Applicants should have a sound experience of all types of overhead construction up to and including 33 kV.

N.J.B. Conditions and Salary Scale No. 4: £765/£870 per annum.

Applications on standard form, obtainable from Area Manager, S.S.E.B., East Port, Dunfermline, should be returned to him not later than Friday, 26 Aug., 1960. (R 618)

SOUTHERN GAS BOARD

APPLICATIONS are invited for the position of SENIOR ELECTRICAL DRAUGHTSMAN in the Central Drawing Office, Board Headquarters, Southampton.

Applicants should have received a good technical education, preferably to Higher National Certificate in Electrical Engineering and be experienced in the design of 415/240 V distribution systems and possess a working knowledge of 11 kV systems. Experience in flameproof installations, illumination, D.C. equipment, testing and inspection would be an advantage.

The successful applicant will be responsible to the Chief Draughtsman for the initial development and detailing of wiring diagrams and preparation of specifications for automatic Stations and electrical equipment on Gasworks.

The starting salary is within APT. 10 to 12 (£975/£1,260) of the National Joint Council for Gas Staffs (Provincial 'A') Salary Scales, according to qualifications and experience.

The successful applicant will be required to pass a medical examination and join the Board's Staff Pension Scheme.

Application forms may be obtained on request from the Personnel Manager, Southern Gas Board, 164 Above Bar, Southampton, and should be returned to him not later than 25 Aug., 1960. (R 627)

CENTRAL ELECTRICITY GENERATING BOARD
London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A and B. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

FOURTH ASSISTANT ENGINEER
ELECTRICAL DEPARTMENT
MEASUREMENT SECTION
CHURCHFIELDS ROAD
BECKENHAM, KENT

Vacancy No. 60/690.

Candidates should have considerable experience of the repair, calibration and testing of polyphase meters, including bulk supply summation metering equipment, together with a knowledge of the repair, calibration and testing of indicating instruments. Experience of electronic techniques as applied to metering and measurements work would be a considerable advantage. The minimum qualification acceptable is the Higher National Certificate in Electrical Engineering or its equivalent. Salary: Class BX, Grade 11. From 1 July, 1960, £905/£1,215; from 1 July, 1961, £950/£1,215 per annum.

OPERATION SUPERINTENDENT
WOOLWICH POWER STATION

Vacancy No. 60/691.

Applicants should have had a comprehensive experience of modern power station operation, together with character and ability to supervise staff. Salary: Class H, Grade 5, £1,400/£1,550 per annum.

Applications, quoting vacancy number to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 29 Aug., 1960. (R 709)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position of OPERATION SUPERINTENDENT at Dalmarnock Generating Station, Glasgow.

Applicants should have had mechanical and electrical experience in a large, modern generating station and possess technical qualifications leading to corporate membership of the Institution of Electrical Engineers or the Institution of Mechanical Engineers. The successful candidate will be responsible for the efficient operation of all plant in the station, which includes 2—60 MW units operating at steam conditions of 900 p.s.i., 900°F.

Salary: N.J.B., Class K, Grade 4, £1,650/£1,830 per annum.

Applications, quoting reference G24/60, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 26 Aug., 1960. (R 628)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

SECOND ASSISTANT ENGINEER
(STATISTICS)

REQUIRED in the Generation Operation Department at Divisional Headquarters, Birmingham. Salary will be in accordance with the new Common Salary Scales of the National Joint Board Agreement, Schedule BX, Grade 5, Scale 14, within the range £1,375/£1,720 per annum.

Candidates should possess Higher National Certificate in electrical and/or mechanical engineering, or an equivalent qualification and have had experience in the operation and maintenance of power station plant.

Apply, quoting vacancy No. 214/60MD, on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13.

Closing date for receipt of applications: 29 Aug., 1960. (R 685)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT COMMERCIAL ENGINEER

APPLICATIONS are invited for the position of Assistant Commercial Engineer in the West Monmouthshire District (Bargoed) in the Monmouthshire and Mid Wales Area of the Board.

Salary: N.J.B. Class H, Grade 9, Scale 8 (£1,040/£1,165) per annum.

Preference will be given to Engineers possessing a Higher National Certificate in Electrical Engineering. They must have had sound technical training, experience in all aspects of service to consumers, and be capable of estimating for domestic, commercial and the smaller industrial installations.

The candidate appointed will be expected to accept responsibility for all aspects of the commercial work in any part of the District. This is an interesting post, which will offer the successful candidate a good opportunity to gain wider experience and fit himself for further promotion.

Applications stating age, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid Wales Area, Llywelyn Rd, Cwmbran, Mon, so as to arrive not later than Saturday, 27 Aug., 1960. Please quote reference 49/60/ET.

Envelopes should be endorsed Assistant Commercial Engineer.

R. G. WILLIAMS,
Secretary.
(R 673)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER
(PROTECTION)

REQUIRED at the Board's No. 2 Sub-Area Headquarters, Sandiway Hse, Northwich, Cheshire. Salary within range £1,440/£1,610 per annum (N.J.B. L/7).

Duties will include testing and commissioning switchgear, transformers and associated equipment up to 33 kV. Applicants should be technically qualified, and possession of a University Degree in Electrical Engineering would be an advantage.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager at the above address. Closing date: 26 Aug., 1960. (R 679)

HAYES & HARLINGTON U.D.C.

ELECTRICAL/MECHANICAL
ASSISTANT ENGINEER

APPLICATIONS are invited for the above permanent appointment. Salary within range £785/£1,070 plus appropriate London weighting. Candidates should be appropriately qualified and have had suitable training and experience (not necessarily in local government). Duties include electrical/mechanical work for buildings, vehicles and plant. Five-day week. Further particulars, conditions, form of application from the undersigned, to whom completed applications must be returned by 5 Sept., 1960.

GEORGE HOOPER,
Clerk and Solicitor.

Town Hall,
HAYES, Middx.

(R 683)

CORPORATION OF GLASGOW
Architectural and Planning Department

ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS for the above superannuable appointment are invited from Graduates and Associate Members of The Institution of Electrical Engineers. Salary scale £795/£1,385 with placing according to qualifications and experience. There is a point within the scale at which increments may be accelerated.

Form of application may be obtained from the Principal Administrative Officer, 20 Trongate, Glasgow C.1.

A. G. JURY,
City Architect and
Planning Officer.
(R 630)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER
LEIGH

THE duties will be to assist the District Engineer in the construction, operation and maintenance of the 33 kV, 11 kV and low voltage distribution systems.

The possession of the H.N.C. and Graduate Membership of the I.E.E. would be an advantage.

Salary scale: £965/£1,090 p.a. Grade J.11. N.J.B. conditions.

Closing date: 31 Aug., 1960.

Previous applicants for this post need not re-apply as their applications will be reconsidered.

SENIOR DEMONSTRATOR
BURY DISTRICT

Applicants must have had a good education with training in Domestic Science and should hold the E.A.W. Diploma. The person appointed will be required to give lectures and demonstrations on all types of domestic appliances, advise consumers on the choice of equipment, and must be capable of supervising staff.

Salary scale: £700 x £25—£775 p.a. Grade 2. N.J.C. conditions.

Closing date: 27 Aug., 1960.

Application forms obtainable from, and to be returned to, the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton. (R 678)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Blackfriars, Perth

ENGINEERING DRAUGHTSMAN
N.J.B. SCALE G13 AT A SALARY OF
£715/£805 PER ANNUM

APPLICATIONS for the above post to be submitted on the Board's application form within 14 days of the appearance of this advertisement. (R 694)

FEDERATION OF RHODESIA AND NYASALAND
Federal Power Board

APPLICATIONS are invited for the following appointment:

SECTION ENGINEER
SALARY: £2,000

Applicants should be Chartered Electrical Engineers and should have had substantial experience in the maintenance of high voltage transmission lines and substations.

The successful applicant will be required to serve initially at Sherwood or Kariba but may subsequently be required to serve at any of the Board's maintenance depots. There is a pension scheme which he will be required to join.

Housing and hard furniture will be provided at reasonable rental. Reasonable transfer and removal expenses of the successful candidate and his family will be paid by the Board.

Application giving full details of education, training, experience, age and marital status should be posted so as to reach The Secretary, Federal Power Board, Reliance House, Moffat St, P.O. Box 630, Salisbury, not later than 15 Sept., 1960. (R 649)

BRADFORD INSTITUTE OF TECHNOLOGY

APPLICATIONS are invited for the post of

SENIOR LECTURER IN
ELECTRICAL ENGINEERING

This rapidly expanding department offers exceptional opportunities for teaching, consulting and research work. Candidates should be suitably qualified to teach to final degree standard in Electrical Power and Machines *or* Electronics and Telecommunications. The successful candidate will be encouraged to develop industrial contacts and to undertake research, for which adequate facilities will be available.

Salary scale: £1,550/£1,750 per annum.

Previous industrial and research experience, at a suitable level, will be taken into account in fixing the commencing salary.

Further particulars and forms of application may be obtained from the Registrar, Bradford Institute of Technology, Bradford 7.

HENRY PATTEN,
Clerk to the Governors.
(R 677)

LONDON ELECTRICITY BOARD

ASSISTANT ENGINEER (COMMERCIAL)

APPLICATIONS are invited for the above position. The successful applicant will be based at 84 Romford Rd, E.15, but will be required to work anywhere in the Eastern District.

Applicants should be capable of carrying out an energetic load development policy and be competent to control Assistant Engineers (Commercial) engaged on supply and tariff negotiation, the application of electrical apparatus and equipment in domestic, commercial and industrial premises, and the estimating for installation and allied work. Possession of the Higher or the Ordinary National Certificate would be considered an advantage.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 12—£940 per annum, rising to £1,065 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref. PER/V/3057/T. (R 710)

MANCHESTER REGIONAL HOSPITAL BOARD

INVITE applications for three posts of ENGINEERING CLERKS OF WORKS (ELECTRICAL AND MECHANICAL) in connection with the hospital capital building programme. Salary: £800 x £40(5) x £50(1)—£1,050. National Health Service conditions and superannuation. Application forms obtainable from the Secretary of the Board, Cheetwood Rd, Manchester 8, to whom they should be returned by 6 Sept., 1960. (R 743)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Area Headquarters

WHERSTEAD, Nr. IPSWICH
207/60.R.
CHIEF ENGINEER'S DEPARTMENT
SECOND ASSISTANT ENGINEER
(DEVELOPMENT SECTION)

Candidates should have had a sound general education and technical training, with experience in the design of 33 kV and lower voltage urban and rural distribution systems, system calculations and the preparation of reports and estimates. Experience of budgeting procedure is desirable. Corporate Membership of the I.E.E. or equivalent qualifications will be an advantage.

Salary: N.J.B. Class BX, Grade 5 (£1,375/£1,720).

Apply by letter to the Chief Engineer, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 6 Sept., 1960.

Chilterns Sub-Area

HEMEL HEMPSTEAD DISTRICT
THIRD ASSISTANT ENGINEER
214/60.N.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary: N.J.B. Class F, Grade 9 (£890/£1,015).

Apply by letter to the Manager, Hemel Hempstead District, Eastern Electricity Board, Bridge St, Hemel Hempstead, Herts, by 2 Sept., 1960.

Northmet Sub-Area

SOUTHGATE, N.14
APPOINTMENT OF SUB-AREA ACCOUNTANT
210/60.R.

Applications are invited from qualified Accountants in the Electricity Supply Industry, for the appointment of Accountant for the Northmet Sub-Area.

Candidates should possess a wide experience of punched card accounting methods including the use of electronic calculators and other up-to-date equipment, as a major programme of mechanisation is in progress. Applicants must also show that they have the ability to direct and supervise a large accounting staff.

This Sub-Area with 472·3 points ranks highest in the Country in the N.J.M. scale and the present salary for this post, including London Weighting, is £2,420/£2,620 in accordance with N.J.M. Grade 5 Class E.

Apply by letter, giving full details of age, qualifications, experience and present position, to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet Hse, Southgate, London N.14, by 9 Sept., 1960.

HENDON DISTRICT
213/60.R.
FOURTH ASSISTANT ENGINEER
(Ref. 1000)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class G, Grade 11 (£825/£940) plus London Allowance.

Apply by letter to F. A. Moinet, M.I.E.E., Manager, Eastern Electricity Board, 137/139 Brent St, Hendon, N.W.4, by 29 Aug., 1960. (R 732)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 209/ET/60.

APPLICATIONS invited for the superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER, TECHNICAL DEPARTMENT, DIVISIONAL HEADQUARTERS.

Salary: Grade AX.10, Scale 8, £935/£1,165 per annum or Grade AX.11, Scale 7, £855/£1,090 per annum, according to experience.

Applicants should possess the Higher National Certificate (Electrical) or equivalent qualifications and have had experience in automatic and line transmission telephone apparatus. Knowledge of remote control, telemetering or V.H.F. radio equipment would be an advantage.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 31 Aug., 1960. (R 721)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

STATION SHIFT CONTROL ENGINEER,
LINCOLN POWER STATION
Vacancy No. 186/60.

APPLICATIONS are invited for the position of Station Shift Control Engineer at Lincoln Power Station, Spa Rd, Lincoln.

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class F, Grade 10 (£825/£940 per annum) of the National Joint Board Agreement, plus shift enhancement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
WILLINGTON "A" AND "B" POWER STATIONS
Vacancy No. 191/60.

Applications are invited for the position of Assistant Maintenance Engineer (Electrical) at Willington Power Stations, nr. Derby.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

SHIFT CHARGE ENGINEER
COVENTRY POWER STATION
Vacancy No. 198/60.

Applications are invited for the position of Shift Charge Engineer at Coventry Power Station. Alderman's Green, Coventry.

Applicants should have had a sound technical training and practical experience in the operation of steam generating plant and main switchgear. An apprenticeship and technical qualifications would be an advantage.

Salary will be in accordance with Class G, Grade 7 (£1,115/£1,245 per annum) of the National Joint Board Agreement, plus 10% allowance for Shift Duties.

Closing date for receipt of applications: 2 Sept., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 725)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

(1) APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER
MOTHERWELL DISTRICT
(2) APPOINTMENT OF THIRD ASSISTANT DISTRICT ENGINEER
COATBRIDGE DISTRICT

APPLICATIONS are invited for the above appointments. Applicants should have had a sound engineering and technical training and should be graduates of the Institution of Electrical Engineers or hold equivalent qualifications.

The salary and conditions of service for these appointments will be in accordance with the National Joint Board Agreement. The posts will be superannuable. It is a condition of these appointments that the successful candidates take stand-by duty in accordance with the above Agreement and reside within a reasonable distance of their respective District Offices.

Applicants for the appointment of Third Assistant District Engineer, Coatbridge District, should have had some experience in the maintenance and operation of H.V. and L.V. overhead and underground networks and be conversant with load flow diagrams and voltage drop and short circuit calculations. Present Classification and Grading: H.9 (Scale 8). Salary: £1,040/£1,165 per annum (revised).

Applicants for the appointment of Second Assistant District Enginer, Motherwell District, should have had experience with the maintenance and operation of H.V. and L.V. overhead and underground networks and substations on a large distribution system. They should also be conversant with load flow diagrams, voltage drop and short circuit calculations and should have had experience with H.V. fault location. Present Classification and Grading: G.7 (Scale 9). Salary: £1,115/£1,245 per annum (revised).

Application forms, which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.

Montrose Crescent,
Hamilton. (R 738)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 210/ET/60.

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT MAINTENANCE ENGINEER (MECHANICAL) at ROGERSTONE POWER STATION.

Salary: Class G, Grade 7, Scale 9, £1,115/£1,245 per annum.

Applicants should have experience in the maintenance of heavy plant and possess H.N.C. or equivalent qualifications.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 31 Aug., 1960. (R720)

SOUTH EASTERN ELECTRICITY BOARD

Kent Area Headquarters

SENIOR ASSISTANT ENGINEER
(COMMERCIAL)

SALARY: £1,795/£1,950 N.J.B. Class L, Grade 4 (Scale 16). Superannuable. Applicants should be suitably qualified and preferably Corporate Members of the I.E.E. The successful applicant will be required to assist the Kent Commercial Officer on all work, but particularly in connection with Industrial and Commercial supplies, street lighting, the preparation of statistics and general development. Experience in contracting work and in the sales of all types of apparatus is desirable. Applications, quoting ET and naming two referees, to the Kent Area Manager, Seeboard, 178 High St, Rochester, Kent, by 31 Aug., 1960.

GEORGE WRAY,
Secretary.
(R 733)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

Vacancy for Shift Charge Engineers

THE Trinidad and Tobago Electricity Commission has vacancies for Shift Charge Engineers.

Applicants should have experience in the operation of modern steam turbines, water tube boilers and diesel generators, and must have Graduate Membership of the I.E.E. or I.Mech.E. or Associate Membership of the I.Mar.E. or the Higher National Certificate in Electrical or Mechanical Engineering or Second Engineer's M.O.T. Diesel and Steam Certificate or Charge Certificate, Royal Navy.

The Annual Salary is £1,408 rising by three annual increments to £1,537. This salary includes a payment for Shift Work.

A partly furnished house will be provided at a rent of £10 8s 4d per month, plus a small extra charge for heavy furniture.

An outfit allowance of £60 is paid on arrival in Trinidad.

First Class passage to Trinidad will be provided for the successful applicant, his wife and children up to a maximum cost of four adult passages. First Class leave passages to the United Kingdom will be provided every three years.

There is a Superannuation Scheme similar to the C.E.G.B. and Area Boards' Scheme.

Information on Trinidad can be obtained from the West India Committee, 40 Norfolk St, London W.C.2.

Applications giving full details of qualifications, age, experience, etc., together with copies of two recent testimonials should be sent by Air Mail to reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, W.I, by 30 Sept., 1960. (R 744)

CENTRAL ELECTRICITY BOARD of the FEDERATION OF MALAYA

ELECTRICAL ENGINEERS

APPLICATIONS are invited for the following appointments on contracts of not less than two years and not more than three years:

(1) CONSTRUCTION ENGINEERS (TRANSMISSION AND DISTRIBUTION)

(2) PLANNING ENGINEERS (TRANSMISSION AND DISTRIBUTION)

(3) POWER STATION ELECTRICAL ENGINEERS (MAINTENANCE)

The salaries for all these posts will be between £2,350 and £3,300 per annum according to experience and marital commitments. Payment would normally be made monthly in Malaya in Malayan dollars at a fixed rate of exchange of 2s 4d to $1 Malayan, but at the option of the officer an amount of up to one-third of the total salary may be paid in sterling to the officer's account in the United Kingdom.

Candidates, who must be not less than 30 years of age, must have had a good general education and be Corporate Members or Graduates of the Institution of Electrical Engineers or possess degrees or other technical qualifications carrying exemption from the Institution Examination, and must have had not less than nine years' experience since obtaining these qualifications, of which several years must have been spent on work of a similar nature to the work required in the post for which application is made.

A brief description of the work involved in these posts is given below:

(1) CONSTRUCTION ENGINEERS (TRANSMISSION AND DISTRIBUTION)

The work involves taking charge of the construction of overhead lines of voltages between 11 kV and 132 kV including, where necessary, the preliminary line and profile survey, substation construction and cable laying.

(2) PLANNING ENGINEERS (TRANSMISSION AND DISTRIBUTION)

The work involves the planning and estimating of new schemes to supply towns and villages or large individual consumers by

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means of extensions from existing high voltage networks.

(3) POWER STATION ELECTRICAL ENGINEERS (MAINTENANCE)

The work involved includes full responsibility for the maintenance and correct operation of all motors, switchgear and ancillary electrical equipment, as well as the main generators and exciters, in steam power stations of up to 80 megawatts capacity.

The salaries offered are all inclusive, but the terms of service include the provision of housing at a nominal rent, free medical attention, a motor car allowance where the work necessitates the use of a vehicle, and terminal leave on full pay at the end of the contract.

First class passages to Malaya and return to the United Kingdom will be provided for the officer, his wife and children up to the age of 16 years, subject to a maximum of three children.

If a married man leaves his family in the United Kingdom, free passages for a family reunion in Malaya during the contract will be provided on request or, alternatively, the officer may elect to go on Annual Leave to the United Kingdom. Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/51121/EE. (R 723)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following position:

FOURTH ASSISTANT DISTRICT ENGINEER TAUNTON

Salary within Class G, Grade 11, Salary Scale 5, £825/£940 per annum, of the N.J.B. Agreement.

The duties of the successful candidate will be to assist in the construction, operation and maintenance of the distribution networks. He may be required to undertake standby duty.

Possession of the Higher National Certificate in Electrical Engineering, or qualifications leading to it, will be an advantage. Possession of a current driving licence is desirable.

Applications to be made on standard form AE6/ACT obtainable by postcard only from the District Manager, South Western Electricity Board, The Parade, Taunton, Somerset. Closing date for receipt of completed applications is Saturday, 10 Sept., 1960. (R 728)

CAMBIA GOVERNMENT

SENIOR ELECTRICAL SUPERINTENDENT

REQUIRED on contract for two tours of 18-24 months each in first instance. Salary according to age and experience up to maximum in scale (including Inducement Pay) £1,152 rising to £1,410 a year. Gratuity at rate 25% total salary drawn. Outfit Allowance £60. Children's allowances up to £192 a year. Free Passages. Liberal leave on full salary. Candidates, preferably under 35 years of age, should possess H.N.C. in Electrical Engineering or equivalent and must have had considerable experience of construction, maintenance and operation of plant, 400 V and 1,100 V lines and installation of domestic and industrial wiring systems. They should also be capable of design and estimate for installations. Knowledge of large diesel engine plants and refrigeration equipment an advantage. Write to the CROWN AGENTS, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/51015/EE. (R 680)

NORTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a SENIOR COMMERCIAL ASSISTANT (PRINCIPAL) at Perth. The main duties will be those of a Consumers' Adviser, and candidates should possess wide experience in commercial matters, particularly relating to Local and Public Authorities, and with special consumer problems on tariff, connection terms and conditions of supply. A broad knowledge of the Electricity Supply Industry is essential. Salary commencing at a point within the range £1,150/£1,355 (N.J.C. Grade 6 or 7), depending on experience and qualifications. Superannuation Scheme. Applications should be made by 3 Sept. on form to be obtained from Area Manager, Blackfriars, Perth. (R 716)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

DUNGENESS-SHERMANBURY 275 kV LINE RESIDENT ENGINEER

Vacancy No. 174/60T.

APPLICATIONS are invited for the post of Resident Engineer, who will be required initially in connection with Headquarters schemes, in particular, the proposed 275 kV line from Dungeness to Shermanbury—via Lydd, and later for similar work engineered by the Division.

It is proposed to make this appointment shortly and the successful applicant would be expected to deal first with the selection of a route for the line and then when the route is approved—the survey and tower positioning. Finally, after the placing of the contract, he would supervise the entire line erection.

A considerable knowledge of all of the above aspects of 275 kV line construction are essential and some experience on a similar contract would be an advantage.

The appointment will be at Third Assistant Engineer level, N.J.B. Class AX, Grade 8, Scale 10, at present £1,105/£1,325 per annum.

The engineer will operate from the Brighton District Headquarters at Brighton "B" Power Station.

Applications, quoting vacancy number, giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 5 Sept., 1960. (R 740)

THE NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the following appointments all subject to N.J.B. Agreement:

SECOND ASSISTANT DISTRICT ENGINEER CROOK DISTRICT

Salary: Schedule A, Class E, Grade 7, £965/£1,090.

THIRD ASSISTANT DISTRICT ENGINEER DURHAM DISTRICT

Salary: Schedule A, Class G, Grade 9, £965/£1,090.

Applicants for the above vacancies must have had sound practical training and experience in construction, operation and maintenance of H.V., M.V. and L.V. overhead and underground distribution networks, substation plant and equipment. Preference will be given to candidates with qualifications leading to corporate membership of I.E.E.

FOURTH ASSISTANT ENGINEER PLANNING AND DEVELOPMENT SECTION SUB-AREA HEADQUARTERS

Applicants should have H.N.C. in electrical engineering or equivalent qualification and suitable training and experience of the planning and design of underground and overhead H.V. and L.V. distribution systems. Salary: Schedule A, Class L, Grade 13, £965/£1,090.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within 10 days of the appearance of this advertisement. (R 717)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division

ASSISTANT ENGINEER
(ELECTRICAL MAINTENANCE)
(Please quote Vacancy ET/111/60)

REQUIRED at Portishead "B" Power Station.

Superannuation Scheme. Salary: N.J.B. Class K, Grade 7, Scale 12, £1,350/£1,500 per annum.

Applicants should have had experience of electrical maintenance in a modern power station and should preferably be Corporate Members of a recognised engineering institution or possess qualifications leading thereto.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 26 Aug., 1960. (R 735)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for two superannuable positions as ASSISTANT SHIFT CHARGE ENGINEERS at Braehead Generating Station, Renfrew, Nr. Glasgow.

Applicants should have had experience of the operation of modern turbo-alternator plant and high pressure boilers and preferably possess a Higher National Certificate in Electrical or Mechanical engineering.

Salary: N.J.B. Class J, Grade 8, (£1,190/£1,325 plus shift allowance of 10% per annum.

Applications on the standard form quoting reference G27/60, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 2 Sept., 1960. (R 729)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

APPLICATIONS are invited for the following positions at Drakelow Power Stations, nr. Burton-on-Trent.

ASSISTANT ENGINEER (EFFICIENCY)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 192/60.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional Institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT ENGINEER (PLANNING)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 193/60.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training

Preference will be given to candidates who are Corporate Members of a recognised professional Institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 £1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 194/60.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional Institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

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Closing date for receipt of applications: 26 Aug., 1960.

ASSISTANT MAINTENANCE ENGINEER
(MECHANICAL)
DRAKELOW "A" AND "B" POWER STATIONS
Vacancy No. 195/60.

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are Corporate Members of a recognised professional Institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Aug., 1960.

PLANT CONTROL ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 199/60.

Experience desirable in control of Boilers and Turbines at high pressure and temperature, pulverised fuel together with electrical control room experience.

Technical qualification to H.N.C. desirable.

Salary will be in accordance with Class L, Grade 10 (£1,190/£1,325 per annum) of the National Joint Board Agreement plus 10% allowance for Shift Duties.

Closing date for receipt of applications: 2 Sept., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.
(R 726)

COUNTY BOROUGH OF SOUTHAMPTON
Borough Engineer and Surveyor's Department

TEMPORARY CLERK OF WORKS
(ELECTRICAL)

REQUIRED immediately in connection with the Council's housing programme. Salary: £14 10s 8d per week.

Applicants should have served an indentured apprenticeship in the Electrical Contracting Industry, with good experience in the supervision of all types of modern electrical installations.

Applications on forms obtainable from the Borough Engineer and Surveyor, Civic Centre, Southampton, returnable by not later than Monday, 5 Sept., 1960. (R 682)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Project Group

THIRD ASSISTANT ENGINEER
(MECHANICAL)

APPLICATIONS are invited for the position of Third Assistant Engineer (Mechanical) at Uskmouth "B" Power Station Site.

Applicants should have had a fundamental training in mechanical engineering, including workshops and should preferably have experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern power stations. Appropriate technical qualifications will be an advantage.

The salary will be in accordance with Schedule C, Grade 7, Scale 13, £1,285/£1,610 per annum of the National Joint Board agreement.

Applications should be made on standard form AE6 available from the Administrative Officer, Midlands Project Group, P.O. Box No. 314, Birmingham 30, and should be returned to him not later than 5 Sept., 1960.

Envelopes should be marked "Confidential" Staff Vacancy Notice No. MPG.59/60. (R 734)

CENTRAL ELECTRICITY GENERATING BOARD
North Eastern and Yorkshire Region

FOURTH ASSISTANT ENGINEER
(CONTROL)
SYSTEM OPERATION

APPLICATIONS are invited for the appointment as Fourth Assistant Engineer (Control) in the system operation Department, Becca Hall, Aberford, Nr. Leeds.

Duties will include compilation of operation statistics and records and assisting with system load control. Power Station Experience will be an advantage.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Class BX, Grade 11 (£855/£1,165 per annum) plus a 10% allowance for shift duties with a minimum of £90 per annum, and will commence at a point commensurate with qualification and experience.

Forms of application may be obtained from any office of the Board or from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 29 Aug., 1960. (R 730)

CENTRAL ELECTRICITY GENERATING BOARD
North Eastern and Yorkshire Region

SECOND ASSISTANT ENGINEER
STEAM TESTING DEPARTMENT
NORTH EASTERN DIVISION

APPLICATIONS are invited for the appointment of a Second Assistant Engineer in the Steam Testing Department with headquarters at Dunston-on-Tyne, to lead a small section carrying out thermal performance tests on modern steam plant.

Applicants should be corporate members of the Institution of Mechanical or Electrical Engineers and should have had previous plant testing experience. A knowledge of power station operation will be considered an advantage.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule B, Grade 5 (£1,375/£1,610 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from any office of the Board or from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than the 30 Sept., 1960. (R 731)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division

THIRD ASSISTANT ENGINEER
CROYDON DISTRICT
Vacancy No. 175/60T.

APPLICATIONS are invited for the above post of Third Assistant Engineer, who will be required initially as Resident Engineer in connection with Headquarters Schemes in the District and later for similar work engineered by the Division.

The Headquarters Schemes include 132 kV and 275 kV overhead lines and substations and the successful applicant should have had considerable experience of the supervision of large switchgear and transformer contracts, including contract correspondence. Similar experience on overhead line construction would also be an advantage.

The appointment will be at Third Assistant Engineer level, N.J.B. Class AX, Grade 8, Scale 10, at present £1,155/£1,375 per annum including London Allowance.

The engineer will operate from the Croydon District Headquarters at Croydon "B" Power Station.

Applications quoting vacancy number, giving age, details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity Hse, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 5 Sept., 1960. (R 742)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

STEAM TESTING DEPARTMENT

APPOINTMENT OF ASSISTANT INSTRUMENT ENGINEER

DUNSTON POWER STATION

APPLICATIONS are invited for the position of Assistant Instrument Engineer at Dunston Power Station, Dunston-on-Tyne.

The successful applicant will be required to assist in the maintenance of all types of instruments and associated control equipment on boilers, turbines and auxiliary mechanical plant.

Applicants should have served a recognised apprenticeship, and have a good technical education. They should have some experience as technicians on comparable equipment.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 12, Class K (£845/£930)

Forms of application may be obtained from any office of the Generating Board, or from the Assistant Regional Secretary (Personnel), North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned not later than 31 Aug., 1960. (R 610)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

FIRST ASSISTANT STATION CHEMIST

REQUIRED for Wolverhampton Power Station. N.J.B. Service Conditions, superannuable appointment, salary within Grade E9, £825/£940 per annum.

Previous experience in a Power Station Laboratory is essential, and candidates should preferably possess the H.N.C. in chemistry. Applicants should be familiar with sampling and analysis of coal and of water and oil and with the application of the results. Duties will include assisting the Station Chemist in the provision of a satisfactory chemical service to the Stations.

Apply, quoting vacancy number 215/60MD on form AE6, available from the Station Superintendent, Wolverhampton Power Station, Commercial Rd, Wolverhampton. Closing date for receipt of application is 2 Sept., 1960. (R 736)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments in the South Wales Division:

ASSISTANT ENGINEER (CO-ORDINATING)
USKMOUTH "B" POWER STATION
Vacancy No. 213/ET/60.

Salary: Schedule A, Class K, Grade 10, Scale 9, £1,115/£1,245 per annum.

Applicants, who should possess an appropriate engineering qualification, should be capable of organising job training for power station employees. The successful candidate will also conduct special investigations, organise Civil Defence and Fire Fighting services, and carry out other general duties as required by the Station Superintendent.

ASSISTANT MAINTENANCE ENGINEER (ELECTRICAL)
USKMOUTH "B" POWER STATION
Vacancy No. 214/ET/60.

Salary: Schedule A, Class K, Grade 7, Scale 12, £1,350/£1,500 per annum.

H.N.C. or equivalent qualifications and experience in maintenance of power station instruments desirable.

STATION SHIFT CONTROL ENGINEER
CARMARTHEN BAY POWER STATION
Vacancy No. 215/ET/60.

Salary: Schedule A, Class K, Grade 10, Scale 9, £1,115/£1,245 per annum.

Applicants should possess H.N.C. or equivalent qualifications, and have had experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned not later than 31 Aug., 1960. (R 739)

YORKSHIRE ELECTRICITY BOARD

APPOINTMENT OF CHIEF ENGINEER

APPLICATIONS are invited for the position of Chief Engineer to the Board at a salary range of £3,750/£4,250 per annum, to succeed Mr J. D. Nicholson, B.SC., M.I.E.E.

Applicants must be fully qualified Electrical Engineers with a wide experience of electricity supply and have held a senior position in a large-scale organisation.

Applications should be returned to The Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than Monday, 12 Sept., 1960.

Head Office

CHIEF ENGINEER'S DEPARTMENT
THIRD ASSISTANT ENGINEER
DISTRIBUTION DESIGN (MAINS) SECTION

Applicants should have had experience in the design and installation of underground cable systems up to and including 33 kV. Some knowledge of oil-filled and gas pressure installations up to 66 kV, of cable manufacture and of overhead line construction will be an advantage.

Applicants should preferably be Corporate or Graduate members of the Institution of Electrical Engineers.

Salary: N.J.B. BX Grade 8 £1,105/£1,230 (transitional) to Scale 11, £1,275/£1,410 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to The Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 2 Sept., 1960. (R 727)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 212/ET/60.

APPLICATIONS are invited for the superannuable N.J.B. appointment of SECOND ASSISTANT STATION CHEMIST at Tir John Power Station, Swansea.

Salary: Class H, Grade 11, Scale 6, £890/£1,015 per annum.

Applicants should possess a Degree in Chemistry or equivalent; experience in water treatment, coal and oil testing and corrosion problems desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 31 Aug., 1960. (R 741)

GAMBIA GOVERNMENT

POWER STATION SUPERINTENDENT

REQUIRED by Electricity Department on contract for two tours, 18/24 months, in first instance. Salary according to age and experience up to maximum in scale rising to £1,375 a year. Gratuity at rate 25% of total salary drawn. Outfit Allowance £60. Children's allowances. Free passages. Liberal leave on full salary.

Candidates, preferably under 45 years of age, should be up to H.N.C. standard and be fully trained fitters capable of training Gambians. They should have experience of maintenance of large diesel generating plant and a knowledge of parallel operation of H.V. generators and electrical safety regulations. Write to the Crown Agents, 4 Millbank, London S.W.1. State age, name in block letters, qualifications and experience and quote M2A/51107/EE. (R 675)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (LOCAL)

STAINES District of No. 1 (Southall) Sub-Area, located at Sunninghill. Salary: N.J.B. Class G, Grade 9 (£965/£1,090 per annum). N.J.B. Conditions of Service.

Applicants should have had experience in operation and maintenance work on overhead and underground distribution systems up to and including 11 kV.

The successful candidate for the above appointment will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middlesex, and returned to him quoting Z.1227, not later than 29 Aug., 1960. (R 737)

ELECTRICAL ENGINEER/ESTIMATOR

Richard Costain Limited require an ELECTRICAL ENGINEER with wide experience of site installation work to prepare layouts and estimates for temporary electrical distribution, control and machinery installations on building and civil engineering sites in the United Kingdom and overseas.

The duties will include advice on the use of electrical equipment applied to contractors' plant and periods on sites at home and overseas, commissioning and inspecting electrically operated plant and installations.

Candidates should preferably possess appropriate academic qualifications but only those with a wide appreciation of the practical requirements for temporary installations on contract sites will be suitable.

Applications should be addressed to:
Senior Personnel Officer,
111 Westminster Bridge Road,
London, S.E.1

(R 747)

ASSISTANT TEST ENGINEER — for new Testing Laboratory dealing with electrical wiring accessories, cartridge fuses, etc. Applicants should have at least O.N.C. or equivalent, and have had previous experience in a similar capacity. A good salary will be offered according to age, experience and qualifications. Applications treated in strict confidence if addressed to Technical Manager, M.K. Electric Ltd., Shrubbery Rd, Edmonton, N.9. (R 624)

ADDITIONAL STAFF. — JUNIOR ENGINEER having distribution experience (preferably with Supply Authority), excavations, cable laying, jointing, switchgear, substations and overhead line construction. FOREMEN capable of dealing with the above.—Written applications to: C. Maurice Contractors Ltd., Lindsey Rd, Bishop's Stortford, Herts. (R 695)

THE ELECTRICITY COUNCIL

invite applications for the appointment of a SENIOR ASSISTANT ENGINEER (Tariffs and Commercial) in the Commercial and Development Department at Headquarters in London.

Applicants should have extensive experience in distribution and commercial activities, and the general economics of the electricity supply industry, with particular reference to the structure, design and application of tariffs. **Preference will be given to those who are Chartered Electrical Engineers or possess an Engineering degree.**

The salary will be within N.J.B. Scale No. 19, i.e., £1,910/£2,455 per annum inclusive of London Allowance, (£1,995/£2,455 from 1 July, 1961), according to qualifications and experience.

Applications stating age, present position and salary and giving full details of qualifications and experience to:

E. Landucci
The Electricity Council
Winsley St, W.1

by 7 Sept., 1960.
Quote Ref. ET/82.

(R 713)

Unilever | CEYLON

ASSISTANT ENGINEER, COLOMBO

Ceylonese nationals, who are qualified mechanical or electrical engineers, are invited to apply for the post of Assistant Engineer in Unilever's company in Ceylon.

Candidates should be under 30.

The man selected will be able to look forward to a progressive management career, and starting salary will be in line with the opportunities offered. Initial training will be given in this country.

Applications should be addressed to:

PERSONNEL DIVISION (T322)
UNILEVER HOUSE BLACKFRIARS
LONDON E.C.4

(R 692)

THE NUCLEAR POWER GROUP

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ELECTRICAL AND MECHANICAL ENGINEERS

To join the Group's commissioning teams at BRADWELL, ESSEX and LATINA, S. ITALY, nuclear power stations.

Applications are invited from men with experience of testing and commissioning of conventional power station plant.

Nuclear training will be given to successful candidates.

Applications, giving age, qualifications and experience should be addressed to:

The Personnel Manager
The Nuclear Power Group
Radbroke Hall
Knutsford
Cheshire

Quoting reference: ET/CMS/5.

(R 712)

A LARGE well-known electrical organisation is increasing its range of manufacture to include power factor correction condensers equipment. Applications are requested from first-class engineers having adequate experience in the design of this product. There is considerable growth opportunity associated with this position and only men with the right class of experience should apply. All applications will be considered in confidence. Please apply Box No. 7959, Electrical Times. (R 706)

DEMONSTRATOR (FEMALE) required in the Evesham District. Applicants must have had a good education and should have a Certificate of a recognised Domestic Training College and/or the E.A.W. Certificate. Some selling experience would be an advantage. Duties include lecture demonstrations in Service Centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Applicants must be prepared to take an active part in the sales organisation. Salary: £600/£700 per annum (N.J.C. Grade 1). Superannuable. Apply, by letter, within 14 days, stating age, education, qualifications, training and experience to District Manager, Midlands Electricity Board, 64 High St, Evesham. (R 748)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. ELECTRICAL SURVEYOR required in Scotland. Permanent position carrying progressive salary scale, £800/£1,100 and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad.I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (R 719)

DEPOT FOREMAN ELECTRICIAN (STAFF) to take charge of electricians' shop. Maintenance and installation of Civil Engineering Plant—electrical side. Preference given to applicant residing within reasonable travelling distance.—Write to Marples, Ridgway and Partners Ltd., Metropolitan Station Approach Rd, Watford, Herts. (R 696)

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EXCELLENT opportunity for TRANSFORMER DESIGNER in Bombay. Preferably single man aged between 35/45 years, having degree in Electrical Engineering from recognised University or equivalent diploma. Good physique, strong personality, able to deal with and influence Government Officials and Engineers at top level. At least 5—8 years' experience with leading Electrical Manufacturer in design and production dealing with Power Transformers up to 10,000 kVA at 136 kV. Able to design independently and improve existing designs in line with best modern practice. Production organising ability. Good salary and prospects with Service Agreement to suitable applicant. Write Box No. 7953, Electrical Times. (R 669)

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Applicants should be in the age group 30-45 years and should have a sound knowledge of combustion and fuel technology and possess a degree in Mechanical Engineering or an equivalent qualification.

Please write giving details of age, experience and qualifications and quoting Reference TSE. to Mr H. G. Pearman, Training and Recruitment Department, Ford Motor Co. Ltd., Dagenham, Essex.

(R 691)

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Required by

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EAST PILTON, EDINBURGH, 5

Applicants should have experience in technical journalism and ability to write lucid descriptions of engineering products and processes for publicity, press and other purposes, and be conversant with advertisement layout. The successful applicant would be required to write for and edit a Works' magazine.

The Company manufacture heavy electrical plant and industrial electronic equipment and experience in those fields would be an advantage.

Full details, in confidence, of age, education, training, experience and salary required to Mr J. S. Baillie, Publicity Manager at above address.

(R 689)

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Telephone for an appointment to the Chief Engineer, Mr L. S. Smith, c/o The B.E.T. Co. Ltd., Hayes, 1954,

or

applications can be made in writing to:

The Personnel Officer
Crompton Parkinson Ltd.
Hayes, Middx.

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SUPERVISING ENGINEER required for well-known London electrical contractor, able to handle works of any size from estimate to account. Apply stating age, experience and salary required to Box No. 7947, Electrical Times. (R 589)

WANDLESIDE CABLE WORKS LTD. require CHIEF ELECTRICAL ENGINEER for their group of Cable Companies responsible for General Electrical and Technical specifications to their Cable Group Managing Director. Applicants should state age and experience and be familiar with the industry. This is an excellent opportunity for the right man with a really progressive Company. Mark your application "Personal" for the attention of the Managing Director, Wandleside Cable Works Ltd., 106 Garratt La, Wandsworth, S.W.18. All applications treated in strictest confidence. (R 615)

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AGENTS REQUIRED England, Scotland and Wales, with established connection with ELECTRICAL WHOLESALERS for CABLE TRUNKING MANUFACTURERS. Write with full details of lines carried and territories covered to Sales Manager, Box No. 7961, Electrical Times. (R 714)

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E.D.A. Testing House

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Attractive salaries commensurate with qualifications and experience will be paid. Good conditions of service include contributory pension scheme, free life insurance, five-day week, canteen facilities, etc. In addition, financial assistance may be available in cases where suitable candidates are faced with housing difficulties.

Apply in writing to the Director and Secretary,
Electrical Development Association,
2 Savoy Hill, London W.C.2

(R 616)

PATENTS

THE proprietor of British Patent No. 747992, entitled "STAND-OFF ELECTRIC INSULATOR," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 S. Dearborn St, Chicago 3, Illinois, U.S.A. (R 634)

THE Proprietor of British Patent No. 774,278 for "APPARATUS FOR MANUFACTURING INSULATING MEMBERS FROM A SUSPENSION OF MICA PARTICLES," desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (R 703)

THE Proprietors of British Patent No. 608,896 for "IMPROVEMENTS IN OR RELATING TO ELECTRIC STORAGE BATTERIES AND ACCUMULATORS," desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (R 702)

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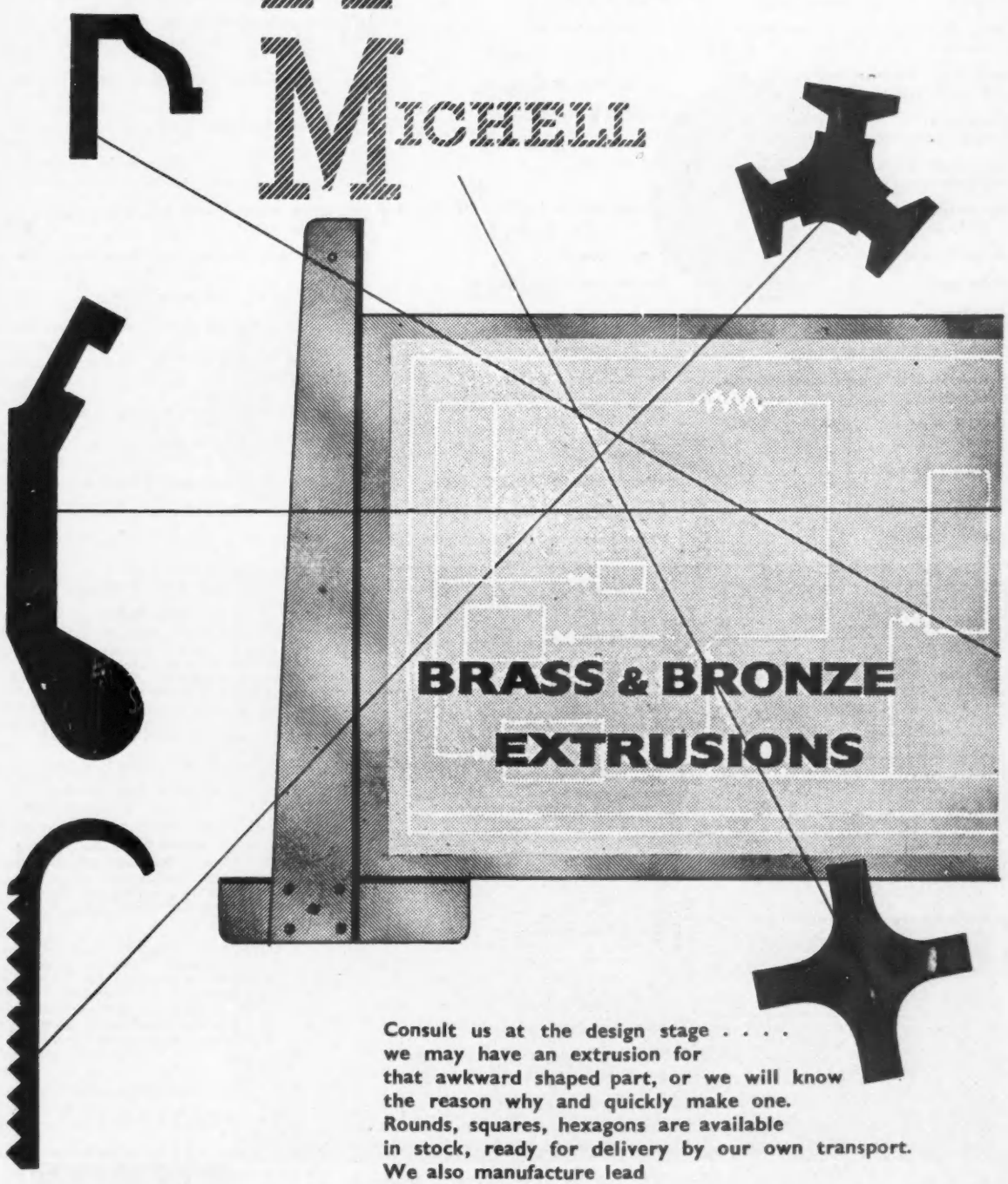

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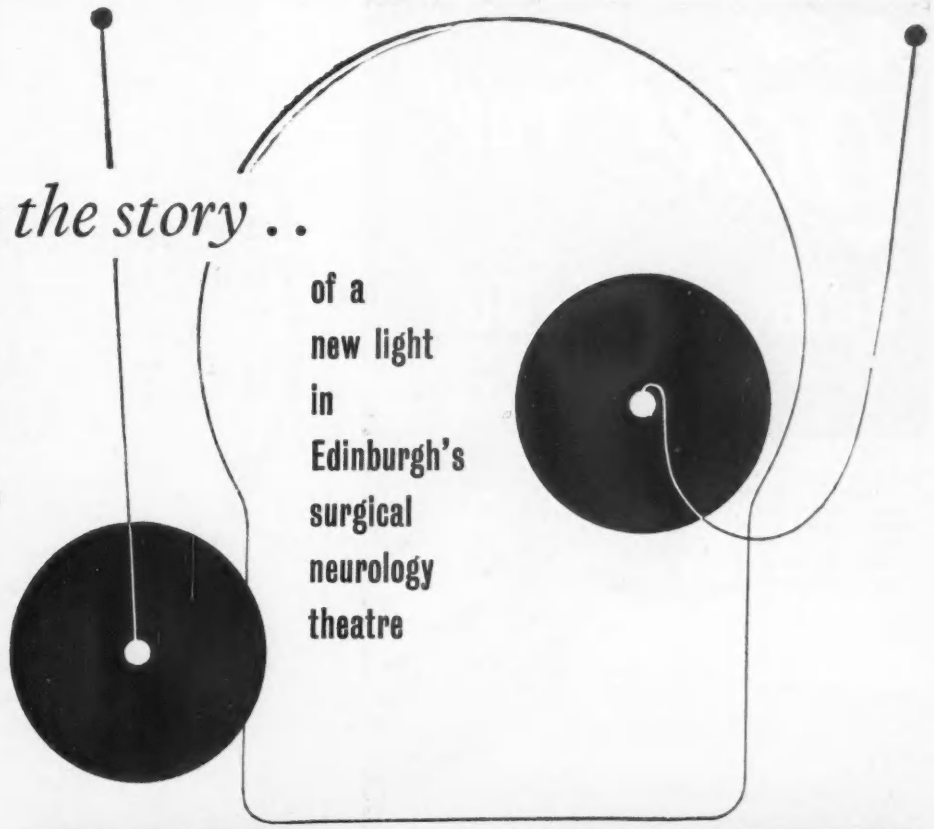

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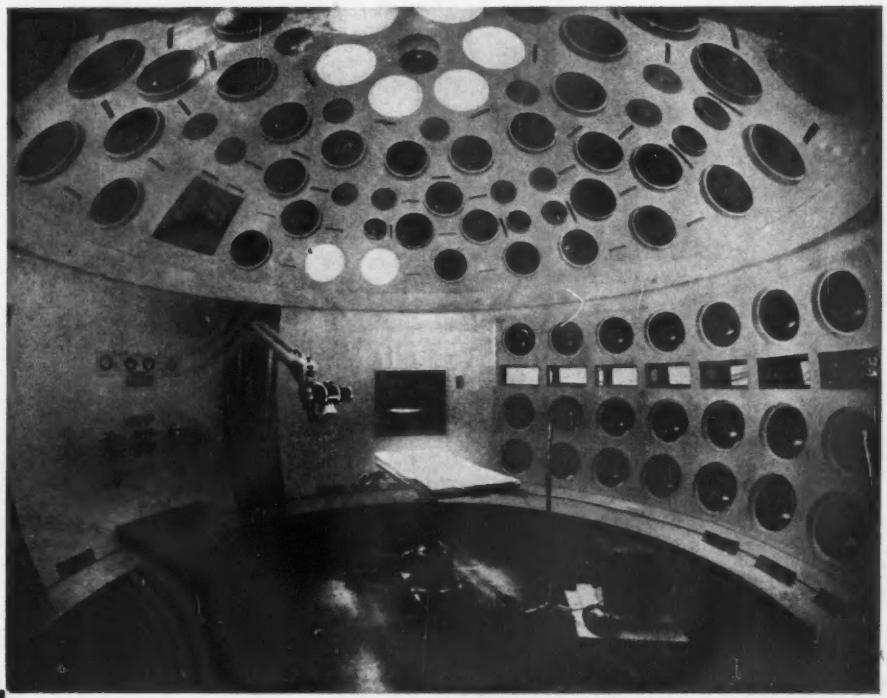

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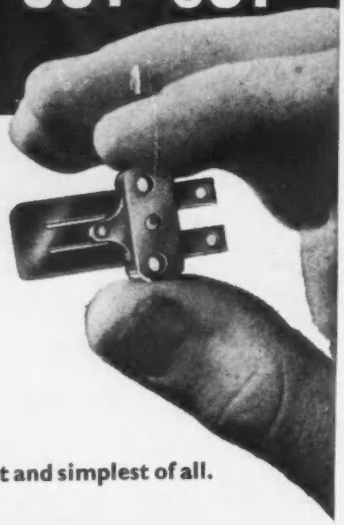

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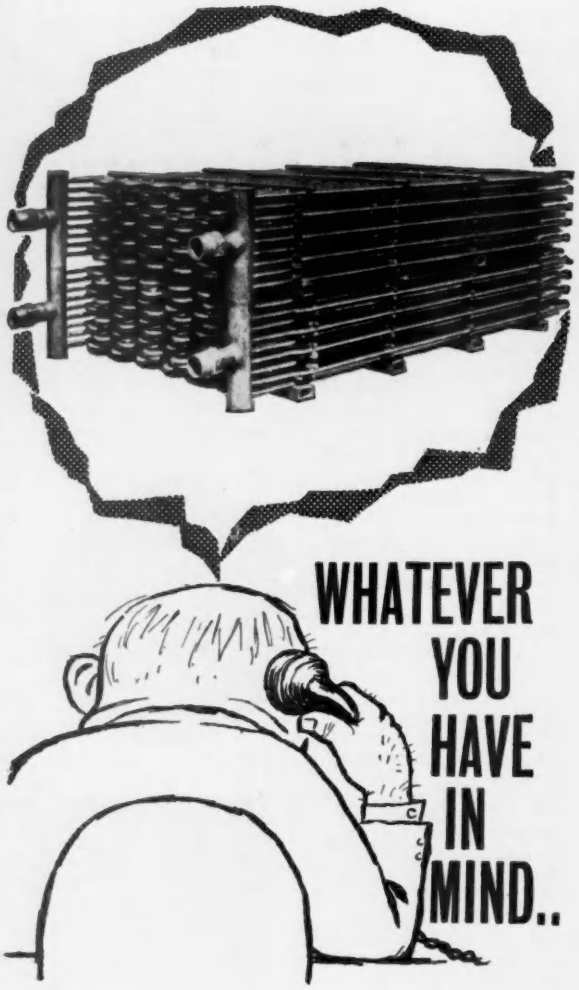

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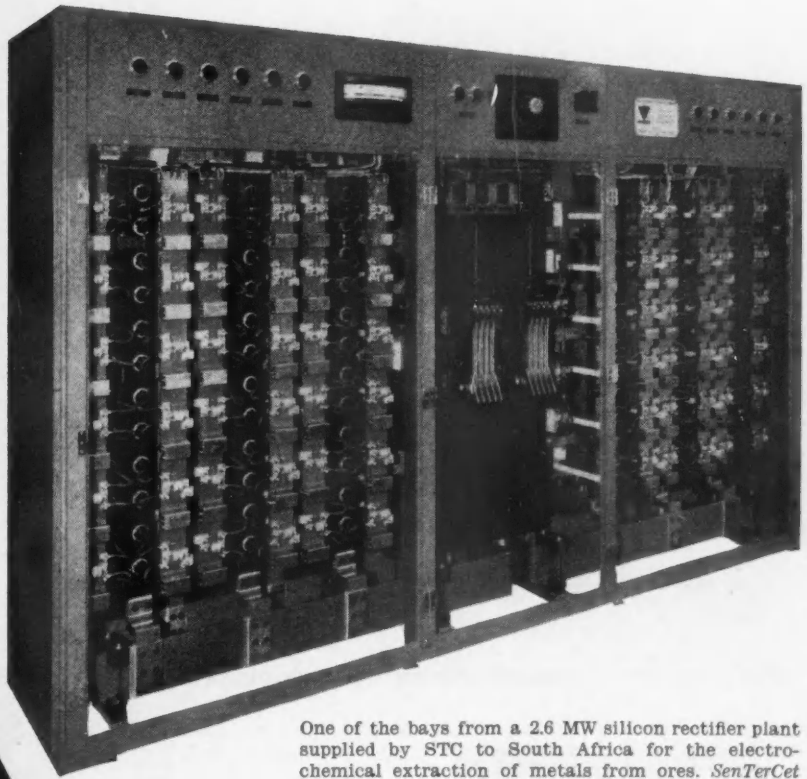

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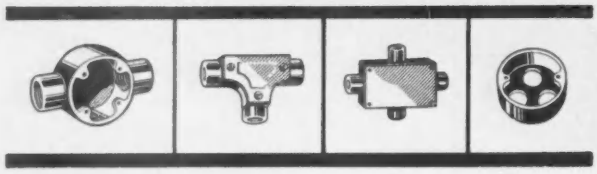

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30	970	25	730
30	725	40	975
50	1460	40	730
50	725	50	1475
*55	720	50	730
70	720	65	1475
*75	970	65	975
100	1455	75	1475
100	725	85	975
*125	1465	100	1480

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50	1450		

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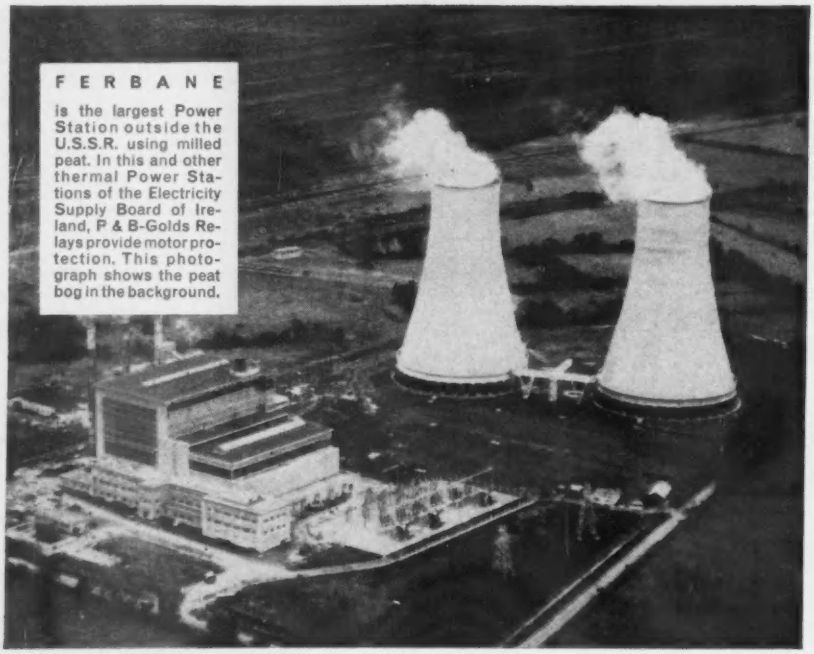

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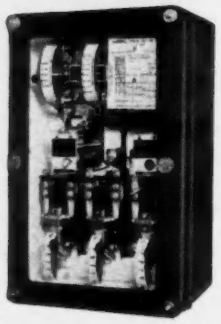

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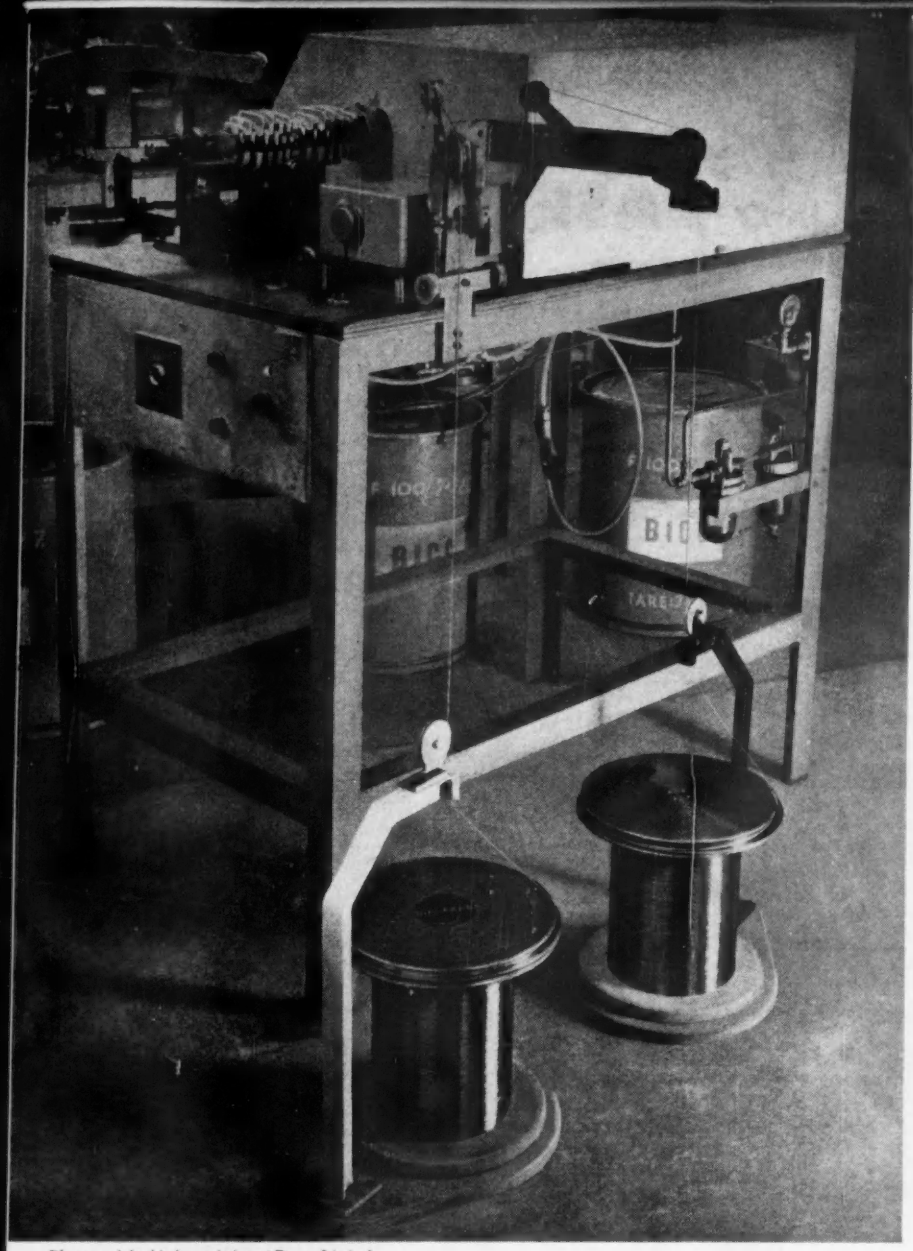

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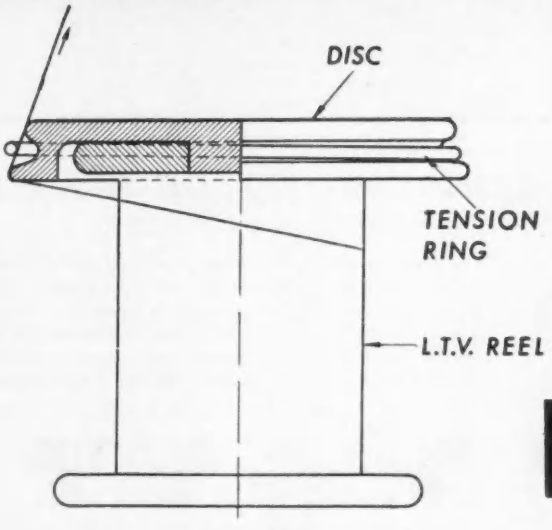

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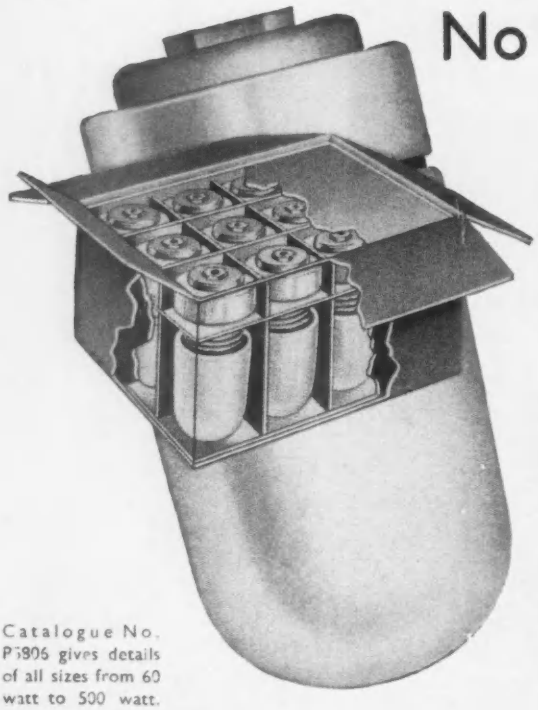

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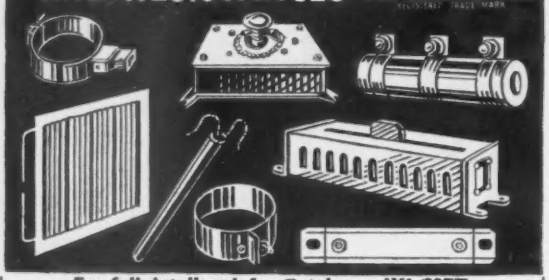

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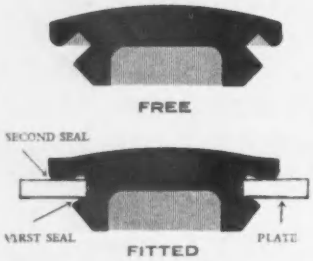

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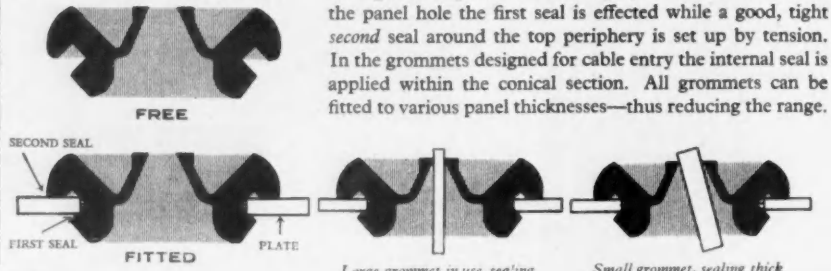

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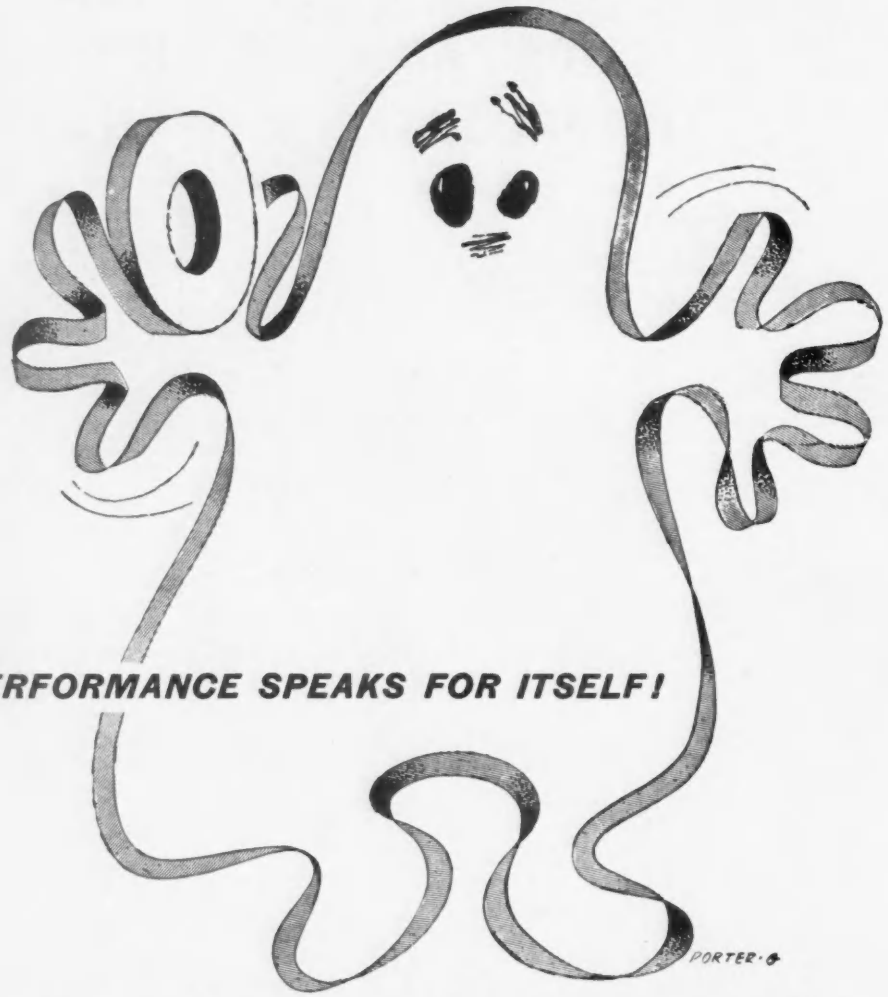

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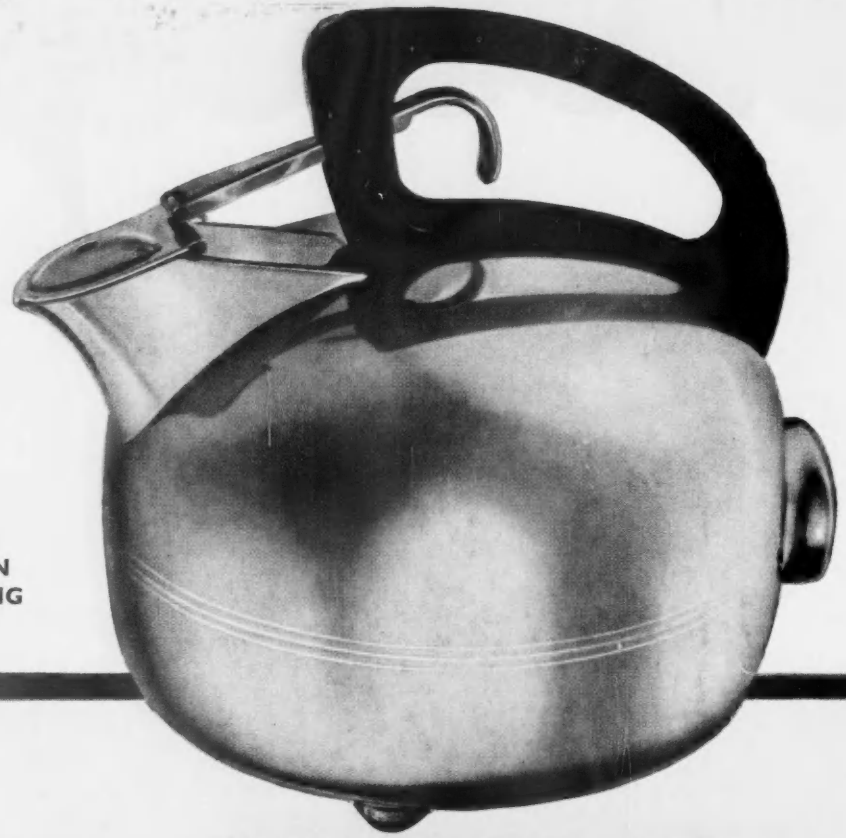

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